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PATENT
Attorney Docket No.: SP01-095

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Michael W. Price and
Gail A. Rodriguez

Serial No: 10/629,397

Filing Date: July 29, 2003

Title: SCATTER FREE UCV OPTICAL
FLUORIDE CRYSTAL ELEMENTS FOR
<00NM LASER LITHOGRAPHY AND
METHODS

Examiner: Ngoc Yen M. Nguyen

Group Art Unit: 1754

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BRIEF ON APPEAL

This Brief supports the appeal to the Board of Patent Appeals and Interferences from the Final Rejection dated November 17, 2005n the application listed above. Applicant filed the Notice of Appeal on January 17, 2006 now submits this Appeal Brief pursuant to a communication from the Examiner dated February 14, 2006

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Corning Incorporated.

II. RELATED APPEALS AND INTERFERENCES

With respect to the appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal, there are no such appeals or interferences.

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III. STATUS OF CLAIMS

Claims 1-8 were rejected in the Final Office Action dated November 17, 2005. These are the pending claims that are the subject of this Appeal and are set forth in the attached Appendix. Claims 9-19 were previously withdrawn from consideration due to a restriction requirement with reservation of reservation of applicants' right to file a divisional application.

IV. STATUS OF AMENDMENTS

1. Claims: There are no amendments to the claims that have been entered by the Examiner. Pending claims 1-8 are original claims.

2. Specification: An amendment to the specification was submitted in applicants' response of January 17, 2006 to the Final Office Action of November 17, 2006. The amendment was to delete Paragraphs [0041] and [0042] which referred to figures that were not filed in the application and to amend Paragraphs [0043] and [0044] to correct figures as listed in Paragraphs [0014] and [0015] of the Brief Description of the Figures. No mention concerning this amendment was given in the Advisory Action of February 14, 2006. Consequently, applicants deem that the amendment has not been entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The claimed invention is directed to a scatter-free optical fluoride crystals having a chlorine concentration of less than 0.25 ppm Cl that can be used in laser lithography methods.

VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The claims are currently rejected by the Patent office as follows:

The Examiner has rejected claims 1-8 under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Sakuma et al (6,377,322) in view of Hammond, et al (6,093,245).

VII. GROUPING OF CLAIMS

In compliance with 37 C.F.R. § 1.192(c)(5), Applicant states that all of the claims do stand or fall together. Claim 1 is the independent claim and claims 2-8 depend on claim 1 either directly or indirectly through another dependent claim.

VIII. ARGUMENTS

The rejection of Claims 1-8 under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Sakuma et al (6,377,322) in view of Hammond, et al (6,093,245) is improper.

A. Summary of the Rejection

In the final Office Action of November 17, 1005, the Examiner rejected claims 1-8 as being unpatentable over Sakuma et al (6,377,322) in view of Hammond, et al (6,093,245). Summarizing the Rejection, the Examiner asserts that Sakuma discloses an optical member for photolithography comprising a calcium fluoride crystal exhibiting an internal transmittance of 99.5%/cm or greater with respect to light transmitted from an F₂ laser (157 nm light). The Examiner admits that Sakuma does not disclose the chlorine concentration in the fluoride crystal.

Further summarizing, Hammond is cited for disclosing that high purity alkali metal halide material is useful as optical elements and that graphite has been used for

growing calcium and barium fluoride crystals. However, while being able to withstand high temperatures, graphite is quite porous. When used as a crucible material for alkali metal growth the melt leaks through the crucible and upon cooling of the crystal they cannot be readily removed without damage to the crucible.

The Examiner goes on to state:

“Sakuma ‘332 discloses a crucible comprising a vessel of porous carbon having a wall with a thickness, an outer surface, and an inner surface; a surface depth region of at least the inner surface being impregnated with additional carbon to close open porosity at the surface (note claim 1). The porous carbon can be graphite (note claim 2) and the additional carbon can be graphite pyrolytic carbon (note claim 3) or glass carbon (note claim 4). The crucible can be used for growing calcium fluoride (note column 6, lines 23-32).

‘Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to maximize the purity of the calcium fluoride disclosed by Sakuma ‘332 as suggested by Hammond’245. Also it would have been obvious to one skilled in the art to use the crucible of Hammond ‘245 in the process of producing calcium fluoride of Sakuma ‘332 because such crucible would permit release of the cooled crystal without remelting (note abstract), since graphite was not in contact with the crystal, any chloride impurity in the graphite would not mitigate to the crystal itself.”

The Examiner then concluded that the arguments presented by applicants in their Response filed on July 25, 2005 were not persuasive. Although applicants did not enclose the Bardsley/Green article with the prior response, based on applicants’ statements that they teach that when impurities, including chlorine, are too high, the transmission of the calcium fluoride below 200 nm would not be as high as applicants’ claims required. However, the Examiner asserts that Sakuma ‘332 discloses a calcium fluoride crystal having an internal transmittance of 99.5% or greater with respect to light emitted from an F₂ laser; and the Examiner concludes that thus the amount of impurities in the calcium fluoride, including chlorine impurity, as disclosed by Sakuma ‘332 would be inherently low as required by applicants’ claims.

With regard to applicants’ argument that Sakuma did not realize that the chloride level in calcium fluoride was a source of scatter, the Examiner replies that even if Sakuma did not realize this, “when the transmittance of the calcium fluoride in Sakuma ‘332 is the same as that of [applicants’] claimed product, the calcium fluoride of Sakuma ‘332 is

considered as “scatter-free” and it would inherently has low chlorine or chloride level.”

Finally, the Examiner states that Hammond is applied to teach that in order to produce highly pure crystals, such as those made of an alkali metal material, for use in an optical application, a crucible such as described in Hammond is used to facilitate removal of the crystal. Since the crystal product of Sakuma is also used in an optical application and is required to have high purity to reduce the scattering effect, it would have been obvious for one of ordinary skill in the art to use the crucible as suggested by Hammond to produce the crystal product of Sakuma.

B. Applicants' Arguments

Applicant respectfully submits that the Examiner failed to provide a *prima facie* case of obviousness because one of ordinary skill in the art would not be motivated to use or modify the teaching of Sakuma et al in view of Hammond to obtain Applicant's invention. In re Vaeck, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991). Applicants submit that the rejection is improper because the Examiner draws conclusions that are not supported by Sakuma in view of Hammond.

The U.S. Court of Appeals for the Federal Circuit has stated that the Examiner has the burden under 35 U.S.C. § 103 to establish a *prima facie* case of obviousness and in the case of combined references, the Examiner can satisfy this burden "only by showing some objective teaching in the prior art . . . would lead that individual to combine the relevant teachings of the references." In re Fine, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). Moreover, both the suggestion and the reasonable expectation of success must be found in the prior art, not in the applicant's disclosure. In re Vaeck, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991).

Cited references should not be considered in a vacuum, but against the background of the references as a whole. "The question in a §103 case is what the references would collectively suggest to one of ordinary skill in the art." In re Ehrreich, 200 U.S.P.Q. 504, 509-10 (C.C.P.A. 1979). If the collective references indicate that those skilled in the art would ignore statements as speculative, then those statements cannot be considered teachings for purposes of an obviousness rejection. Id.; In re Oelrich, 198 U.S.P.Q. 210, 214 (C.C.P.A. 1978). In the instant case, as discussed below, the combination of Sakuma et al in view of Hammond et al teach or suggest a critical feature of the claimed invention; namely, having a chloride level of <0.25 ppm..

Consequently, Applicants submit that not only did the Examiner fail to meet his burden of establishing a *prima facie* case because one of ordinary skill in the art would not only lack the motivation to modify Sakuma in view of Hammond, but also because the combination does not teach or suggest reducing scatter by lowering chloride levels.

Applicants' invention is directed to the reduction of scatter in CaF₂ crystals. Specifically, it is directed to the reduction of scatter by reducing the chloride level in CaF₂ to less than 0.25 ppm. The reduction of scatter is not mentioned in either the Sakuma or the Hammond citation. Further, in neither citation do the authors/inventors provide any analysis of the chloride level present in the CaF₂ crystals they grow. As a result, distinguishing applicants' claimed invention over the cited art must rely on reasonable arguments.

First, a literature search conducted after receiving the present Office Action resulted locating an article by W. Bardsley and G.W. Green, "Optical scattering in calcium fluoride crystals", Brit J. Appl. Phys., 1965, Vol. 16, pages 911-912 [copy enclosed]. In this article the authors state that while it is generally believed that scatter in CaF₂ crystal is caused by

calcium oxide, they present evidence that shown that chlorine and sulfur can also cause scatter. This article supports applicants' position that the present of chloride and/or sulfur in CaF_2 crystals induces scatter. The article indicates that chlorine and sulfur levels should be below 50 ppm and 20 ppm, respectively; though how much below is not specified. However, at the time Beardsley and Green article was written (1965), high power excimer lasers operating below 200 nm were unknown (excimer lasers were not invented until about 1971) it is unlikely that the effect of very small amounts of chlorine and sulfur in CaF_2 optics were considered as having an influence on scatter. The He/Ne was the only gas laser truly known and used at this time, the CO_2 and Ar lasers not having been invented until about 1964. Thus the Bardsley/Green articles does not provide any guidance regarding the level to which chloride and/or sulfur should be reduced in order to prevent scatter in CaF_2 crystals that are used for lasers operating below 200 nm and particularly for F_2 lasers that operate at 157 nm. There is certainly no teaching or suggestion that the chloride levels should be reduces to sub-ppm levels as is taught by the present invention. As a result, in the years that followed, up to the present invention, the influence of sub-ppm levels of chlorine on CaF_2 optics was neglected and not considered as a source of scatter.

Second, the cited Sakuma patent is completely silent, as was acknowledged by the Examiner in the Office Actions, with regard to the chloride content of the CaF_2 crystal. Applicants have searched the PTO Patent Base for other Sakuma patent using the terms "IN/Sakuma and AN/Nikon", and have reviewed each of the patent found. Applicants have also reviewed patent issued to Sakuma's co-workers at Nikon (Shiozawa, Mizugaki, Kimura and Takano) and reviewed the patents found in these searches. None of these patents mention *chloride* contaminant levels in CaF_2 optics. The only mention of contaminants found in the patents located in the foregoing searches concerning CaF_2 manufacture are the levels of sodium and potassium (Shiozawa, US 6,320,700, 6,226,128 and 6,061,174). Consequently,

applicants are led to believe that Sakuma and co-workers did not consider chloride levels to be a source of problems for CaF_2 crystals. This is fortified by the fact that the carbon ingot manufacturers (the ingots are used for making the crucibles used in CaF_2 crucibles) mention only metallic impurities and not non-metallic impurities. As a result of these reviewed patents, applicants reasonably believe that Sakuma and co-workers did not realize that sub-ppm chloride levels in CaF_2 were a source of scatter.

Third, the Hammond patent is cited for teaching that one can apply a pyrolytic or glassy carbon coating to a crucible to close the pores of the crucible. Hammond used this technique to prevent molten alkali metal fluoride from seeping through the crucible via its pores. Hammond made no mention of either using the technique for molten alkaline metal fluorides or whether it was even necessary to use it for non-alkali metal fluorides. Since none of the Sakuma and other Nikon assigned patents that were reviewed mentions the use of such crucibles, nor do the present applicants use such crucibles, applicants submit that the Hammond technique is unnecessary. Hence, there is no teaching applicable to the present invention and the use of Hammond should properly be withdrawn.

However, for arguments' sake and completeness only, we will assume that sealing the pores of a graphite crucible is desirable to prevent leakage of a molten alkaline earth metal fluoride. Using the Hammond technique one first purifies the crucible by using *a high temperature chlorine technique* ('245 patent, column 3, lines 37-39). Subsequently, one applies the pyrolytic or glassy carbon coating by decomposition of an organic vapor such as an ether or an alcohol. Hammond states that carbon from the decomposition fills the pores of the graphite crucible. However, during this process the chlorine present in the crucible, which is increased as a result of the chlorine purification step, can migrate into the layer of pyrolytic or glassy carbon that is being deposited. While the resulting coating may be "smooth" and prevent a metal fluoride from seeping onto the crucible's pores, the coating

very likely contains a high level of chlorine that would enter and contaminate a CaF_2 crystal and increase scatter in the below 200 nm region. Hammond does not mention what is the level of chlorine (or chloride) in either the coated crucible or his alkali metal fluoride products.

Fourth, applicants submit that the Rejection is improper because the Examiner draws conclusions from Sakuma '332 that are not supported by the patent. In particular, in the final Office Action the Examiner stated that because Sakuma discloses an *internal transmittance* of greater than 99.5%, the crystal of Sakuma must have a low chloride level. *The Examiner is making an invalid assumption that the chloride level in Sakuma '332 must be the same as that of the claimed invention.* Sakuma does not mention chloride levels and any assumption that the chloride level in the Sakuma crystals is the same as in applicants' crystals is pure speculation as will be further explained below. Such speculation cannot be the basis for an obviousness rejection.

Fifth, the Examiner has assumed that applicants' transmittance and that of Sakuma are the same. This is incorrect. As applicants state in their specification and in claim 3, crystals containing less than <0.25 ppm Cl have a <200 nm transmission of >99%. In contrast to applicants' invention, in column 7, lines 20-23, Sakuma '332 states that the crystals claimed therein has an *internal transmission* of 99.5% and an *overall transmission* of approximately 89.5%. Sakuma is very careful to distinguish internal transmission from overall transmission. Sakuma attributes the difference to reflectance. However, since Sakuma is not aware of the influence chloride can have on transmission through a crystal by producing scattering, such scatter losses may

constitute part of the losses Sakuma attributes to reflectance. Note that in Column 7, lines 23-26, Sakuma further states that even if the *internal transmittance* is 100%, then transmittance taking into account reflection loss is 90.9% regardless of the substrate thickness. With this statement Sakuma is saying that the maximum transmittance one can obtain with a calcium fluoride crystal of any thickness is 90.9%. *This statement teaches away from the claimed invention* as described applicants' specification and claimed in claim 3 wherein applicants claim (in combination with base claim 1) a crystal having a transmission of >99% and a chloride level of <0.25 ppm. Consequently, applicants submit that Sakuma '332 again does not teach or suggest the claimed invention.

Sixth, applicants now refer to applicants' Figure 16 and Paragraph [0058]. As illustrated in Figure 16, the crystals C#1, C#2 and C#3 are stated as having "No Scatter". In each of these crystals the Cl level is less than the 0.25 ppm level claimed in applicants' claim 1. However, crystal C#4 does produce scatter and the Cl level in this crystal is 0.3 ppm which is above the 0.25 ppm level of claim 1.

There is no reference in Sakuma '32 as to the chloride level present in the crystals described therein. However, in column 7, lines 20-26, Sakuma clearly states that the maximum transmission level through a calcium fluoride crystal, even one having 100% internal transmittance, is approximately 90%. He attributes the approximately 10% difference between the internal transmittance and overall transmittance to reflection losses. However, since Sakuma is unaware of the effect that chloride can have on a crystal by producing scatter, it is arguable that a substantial

part of what Sakuma attributes to reflection losses is actually due to scatter produced by chloride in the crystal.

Applicants' data as shown in Figure 16 and explained in Paragraph [0058] clearly indicate that scatter is produced at a chloride level of 0.3 ppm. *Arguendo*, the crystals of Sakuma probably contain a chloride level greater than 0.25 ppm and the scatter produced by this chloride could account for the overall losses Sakuma reports for their crystals.

Applicants' Figure 9A illustrates a CaF_2 crystal in normal (room) light. Figure 9B illustrates a crystal in which the normal light has been turned off and a red laser inspection light is passed through the crystal. Figure 9B clearly shows the scatter that is present in the crystal. As applicants explain in Paragraph [0044]: *"In a scatter-free calcium fluoride disk blank one would not see any red streak in the crystal since there would be nothing to **reflect or scatter** the light in the middle of the crystal."*

Applicants submit that the facts that (a) Sakuma is unaware of the effect of chloride in transmission, and (b) that the scatter produced by chloride in a crystal can reduce transmission as shown by applicants, and (c) that Sakuma clearly states that overall transmittance of his claimed crystals is approximately 90% (column 7, lines 20-26) is due to "reflectance losses" clearly indicate that Sakuma '332 does not teach or suggest the claimed invention.

Seventh, with further regard to Sakuma in view of Hammond '245, applicants repeat that since Hammond purifies crucibles using a high temperature chlorine treatment, the use of such crucibles would tend to increase the chlorine content of any calcium fluoride crucible grown in such crucibles. Consequently, since both

Hammond and Sakuma do not teach or suggest that chloride can have a detrimental effect on crystals used for <200 nm light transmission, and since Sakuma clearly indicates that his crystals have an overall transmittance of approximately 90%, and since applicants have clearly indicated that chloride can account for all or part of the approximately 10% transmission losses acknowledged by Sakuma; applicants submit that the combination of Hammond and Sakuma does not teach or suggest the claimed invention.

IX. CONCLUSION

In conclusion, Applicant requests a reversal of each of the grounds of rejection maintained by the Examiner and prompt allowance of the pending claims 1-8.

Please charge the necessary fees for filing the Brief on Appeal to our Deposit Account No. 03-3325. If there are any other fees due in connection with the filing of this Brief on Appeal, please charge the fees to our Deposit Account No. 03-3325. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,

Dated: 15 March 2006

By: Walter M. Douglas

CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.8:

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Date of Deposit

Walter M. Douglas 15 March 2006
Walter M. Douglas

Walter M. Douglas
Registration No. 34,510
607-974-2431
Corning Incorporated
Patent Department
SP-TI-03-01
Corning, NY 14831

CLAIMS APPENDIX TO BRIEF ON APPEAL

The claims on appeal are as follows.

Listing of Claims:

1. (original) A scatter-free optical fluoride crystal for transmitting below 200 nm wavelengths comprising an optical fluoride crystal having a chlorine concentration of less 0.25 ppm Cl
2. (original) A scatter-free according to claim 1, wherein said optical fluoride crystal is selected from the group consisting of calcium fluoride, barium fluoride, magnesium fluoride, strontium fluoride and lithium fluoride, and mixtures thereof.
3. (original) The scatter-free crystal according to claim 1, wherein said optical fluoride crystal is a calcium fluoride crystal having a below 200 nm transmission >99%.
4. (original) The scatter-free crystal according to claim 1, wherein said optical fluoride crystal is a calcium fluoride crystal having a chlorine concentration of less than 0.2 ppm Cl and a 193nm transmission >99%.
5. (original) The scatter-free crystal according to claim 1, wherein said optical fluoride crystal is a calcium fluoride crystal having a chlorine concentration of less than 0.2 ppm Cl and a 157nm transmission >99%.
6. (original) The scatter-free crystal according to claim 1, wherein said optical fluoride crystal is a calcium fluoride crystal having a chlorine concentration of less than 0.2 ppm Cl and a 157nm transmission >99%.

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7. (original) The scatter-free crystal according to claim 1, wherein said optical fluoride crystal is a calcium fluoride crystal having a combined chlorine and sulfur concentration Cl + S of less than 0.3 ppm Cl and a transmission >98% in the 157-199 nm range.
8. (original) The scatter-free crystal according to claim 7, wherein Cl + S is less than 0.2 ppm and a 157 nm transmission >99%.
9. (withdrawn) A method of making a scatter-free below 200 nm wavelength transmitting optical fluoride crystal, said method comprising:
 - providing a optical fluoride feedstock having a chlorine content less than 0.5 ppm Cl by weight,
 - providing crucible comprised of a low-chlorine graphite having a chlorine content less than 0.3 ppm Cl and placing said feedstock into said crucible,
 - melting said feedstock in said crucible to form a low-chlorine optical fluoride melt, and
 - growing an optical fluoride crystal from said melt,
 - wherein said grown optical fluoride crystal having a chlorine concentration less than 0.25 ppm Cl.
10. (withdrawn) The method according to claim 9, wherein the feedstock is selected from the group consisting of calcium fluoride, barium fluoride, magnesium fluoride, strontium fluoride and lithium fluoride, and mixtures of any of the foregoing.
11. (withdrawn) A method as claimed in 9 wherein the optical fluoride crystal is a calcium fluoride crystal, and said method includes transmitting a scatter inspection light into said grown optical fluoride crystal and inspecting the crystal for an

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observable level of scatter to provide a scatter-free optical fluoride lens blank with a chlorine concentration less than 0.2 ppm Cl by weight.

12. (withdrawn) A method as claimed in 9 wherein said feedstock chlorine content is ≤ 0.4 ppm.

13. (withdrawn) A method as claimed in 9 wherein said feedstock is calcium fluoride having a chlorine content is ≤ 0.25 ppm, said crucible graphite chlorine content is ≤ 0.25 ppm, and said grown calcium fluoride crystal has a chlorine concentration ≤ 0.2 ppm.

14. (withdrawn) A method as claimed in 12 wherein said grown calcium fluoride crystal has a 193 nm transmission $> 99\%/cm$.

15. (withdrawn) A method as claimed in 12 wherein said grown calcium fluoride crystal has a 157 nm transmission $> 97 \%/cm$.

16. (withdrawn) A method of making a scatter-free optical fluoride crystal for transmitting below 200 nm wavelengths, said method including:

providing a low-chlorine content optical fluoride feedstock having a chlorine content less than 0.5 ppm Cl,

providing an optical fluoride crystal crucible for containing an optical fluoride crystal, said crucible comprised of a purified graphite having a chlorine content less than 0.3 ppm Cl,

providing a controlled atmosphere optical fluoride crystal furnace for heating an optical fluoride crystal material,

loading said optical fluoride feedstock and said optical fluoride crystal crucible into said optical fluoride crystal furnace,

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heating said feedstock into a low-chlorine melt and

growing an optical fluoride crystal from said melt to provide a grown scatter-free optical fluoride crystal having a chlorine concentration less than 0.25 ppm Cl and a below 200 nm transmission > 99%/cm .

17. (withdrawn) A method as claimed in claim 15, wherein said optical fluoride feedstock is selected from the group consisting of calcium fluoride, barium fluoride, magnesium fluoride, strontium fluoride and lithium fluoride.

18. (withdrawn) A method as claimed in claim 15. wherein said low-chlorine content optical fluoride feedstock is selected from the group consisting of a synthetic powder and a pre-melted fluoride crystal material.

19. (withdrawn) A method of making an optical calcium fluoride crystal, including blanks and elements made therefrom, for transmitting below 200 nm wavelengths, said method including:

providing a controlled atmosphere optical fluoride crystal furnace for heating an optical fluoride crystal material, said furnace containing a calcium fluoride crystal material and a purified graphite having a chlorine content less than 0.3 ppm Cl by weight,

heating said calcium fluoride crystal material in said furnace containing said graphite having a chlorine content less than 0.3 ppm Cl to provide a scatter-free optical calcium fluoride crystal having a chlorine concentration less than 0.25 ppm Cl by weight and a below 200 nm transmission > 99%/cm.



EVIDENCE APPENDIX

1. Evidence

1. W. Bardsley and G.W. Green, "Optical scattering in calcium fluoride crystals", Brit J. Appl. Phys., 1965, Vol. 16, pages 911-912
2. U.S. 6,320,700 to Shiozawa
3. U.S. 6,226,128 to Shiozawa
4. U.S. 6,061,174 to Shiozawa,

2. Location of Patent Evidence

The Patent Evidence above was cited by applicants during prosecution in their replies to the rejections.

Copies of the Evidence are enclosed with this Brief.

3. Case Law (copies enclosed)

In re Vaeck, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991)

In re Fritch, 23 U.S.P.Q.2d 1780, 1783-84 (Fed. Cir. 1992)

In re Fine, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988)

In re Ehrreich, 200 U.S.P.Q. 504, 509-10 (C.C.P.A. 1979)

In re Oelrich, 198 U.S.P.Q. 210, 214 (C.C.P.A. 1978).

Case law was cited by applicants in the Appeal Brief .

RELATED PROCEEDINGS APPENDIX

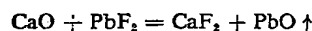
NONE

Optical scattering in calcium fluoride crystals

Abstract. It is generally believed that scatter in calcium fluoride crystals is invariably caused by calcium oxide. Evidence is presented which shows that chlorine or sulphur can also cause scatter and that they are the source of the residual scatter sometimes observed in single crystal material doped with rare earth elements.

Scatter, caused by particles of the order of $1\text{ }\mu\text{m}$ diameter, has been a major problem in the production of calcium fluoride laser crystals of the highest quality.

Stockbarger (1949) attributed scatter in CaF_2 to the presence of calcium oxide and used additions of lead fluoride (purging) to remove oxygen by the reaction



We believe scatter may have several different causes; certainly gross contamination of the gas atmosphere by water vapour and air can cause the effects noted by Stockbarger. The purpose of this letter is, however, to report evidence which suggests that sulphur and chlorine are more probably the causes of the residual scatter which is often experienced.

In this laboratory single crystals of calcium fluoride have been grown by pulling from the melt with an apparatus previously described by Cockayne *et al.* (1964) but with the silica envelope water-cooled to avoid reaction with calcium fluoride vapour. The starting charge usually was purged lump mineral fluorite (obtained from Barr and Stroud Ltd). Pulled from a vitreous carbon crucible (obtained from The Plessey Co., Ltd) in an atmosphere of dried purified argon, the undoped material normally yielded crystals in which the scatter was too small to be measured by the method of Kaiser and Keck (1962) (extinction scattering coefficient $<0.005\text{ cm}^{-1}$) and was not visible to the eye in a strong beam of light. Any scatter which was detectable was reproducibly characteristic of the particular batch of fluorite used.

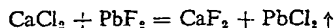
In order to check whether surface contamination could introduce sufficient oxygen to cause scatter the starting charge was exposed to the atmosphere for up to two days. It was also boiled in water for up to 2 hours. In both cases such treatment did not cause any additional scatter in the crystals.

However, by doping calcium fluoride with various materials we were able to elucidate certain sources of scatter. Between 60 and 200 parts per million of oxygen added as calcium oxide to the melt was necessary to cause detectable scatter; rather less than this amount gave rise to a characteristic red fluorescence when the crystal was illuminated with white light. On the other hand scatter was not observed when the crystals were doped with rare earth oxides at concentrations of up to 3%, which was the maximum amount added. It is interesting that enough divalent samarium was present in crystals doped with 0.1% samarium oxide for laser action to be obtained (Forrester, Green and Sampson 1965).

When sulphur was added to the melt at a concentration of 20 parts per million in the form of CaS or CaSO_4 , detectable scatter was produced. The scattering centres were in the form of hexagonal platelets orientated in (111) planes and similar to those observed by Stepanov and Feofilov (1956, p. 181). Such platelets were also observed in undoped crystals annealed under vacuum in a graphite tube. These crystals had a faint characteristic smell of H_2S and, indeed, analysis showed they contained some 20 parts per million of sulphur. The platelets did not appear in crystals annealed in a sulphur-free vitreous carbon tube.

Scatter was also observed to a variable extent in crystals doped with rare earth fluorides. Dysprosium fluoride has been particularly troublesome and analysis has shown that up to 0.4% of chlorine was present, with only trace quantities of other elements. When chlorine was added to the pure melt at concentrations of 50 parts per million in the form of anhydrous

calcium chloride considerable scatter was produced. The scatter could be suppressed by adding 100 parts per million of lead fluoride. In this case the chlorine could leave the melt possibly by the reaction



We have obtained a correlation between the chlorine content of synthetic calcium fluoride and the scatter in crystals grown from this material. Chlorine has been identified as an impurity in calcium tungstate crystals which also causes scatter (Cockayne 1965).

From these facts it will be seen that scatter can result from oxygen, chlorine and sulphur when present in concentrations which exceed the limit of solid solubility. When the crystal cools down the excess is precipitated as a second phase. The absence of scattering centres near to surface, grain boundaries and tilt boundaries suggests that the form of the precipitates is dependent on the vacancy concentration in the crystal. (Phillips and Hanlon 1963).

Physics Department,
Royal Radar Establishment,
Malvern, Worcs.

W. BARDSLEY
G. W. GREEN
21st April 1965

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STEPANOV, I. V., and FEOFLOV, P. P., 1956, *Growth of Crystals* (In English translation, Consultants Bureau Inc., New York, 1958).
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CORRIGENDA

The relationship between space-charge-limited current and total emission of diodes, by P. W. COUTTS and R. K. FITCH (*Brit. J. Appl. Phys.*, 1964, **15**, 1327).

The temperature ranges given for the various points on the figure of this paper are incorrect. They should be as follows:

$$\blacksquare \text{ } 1105\text{--}1120^\circ\text{K}, \quad \bullet \text{ } 1090\text{--}1105^\circ\text{K}, \quad + \text{ } 1075\text{--}1090^\circ\text{K}.$$

The paper was written on the assumption that the points were indicated correctly and this error in no way affects the arguments presented.

Induced conduction in dielectric liquids, by I. ADAMCZEWSKI (*Brit. J. Appl. Phys.*, 1965, **16**, 759).

Page 763, line 8: equation should read $\log \mu_+ = A_1 - \frac{2}{3} \log \eta$.
line 23: range should be 100-1500 Å.

Page 766, 2 lines from bottom: range should be $(7.2 - 12) \times 10^{-10} \text{ cm}^3 \text{ per ion sec.}$

Page 767, line 12: equation should read

$$\frac{2}{3} F_1 = -0.174 nkT + 0.0139 (5.05 + n).$$

References

- ADAMCZEWSKI, 1937b: Journal should be *Ann. Phys., Paris*.
DAVIS *et al.*, 1962a: Pages 947 and 2470.

remaining federal law count and the state law counts. Thus, we ORDER entry of summary judgment on Counts I-IX. IT IS SO ORDERED.

Court of Appeals, Federal Circuit

In re Vaack

No. 91-1120

Decided October 21, 1991

PATENTS

1. Patentability/Validity — Obviousness — Combining references (§115.0905)

Rejection of claimed subject matter as obvious under 35 USC 103 in view of combination of prior art references requires consideration of whether prior art would have suggested to those of ordinary skill in art that they should make claimed composition or device, or carry out claimed process, and whether prior art would also have revealed that such person would have reasonable expectation of success; both suggestion and reasonable expectation of success must be found in prior art, not in applicant's disclosure.

2. Patentability/Validity — Obviousness — Relevant prior art — Particular inventions (§115.0903.03)

Patent and Trademark Office has failed to establish prima facie obviousness of claims for use of genetic engineering techniques for producing proteins that are toxic to insects such as larvae of mosquitoes and black flies, since prior art does not disclose or suggest expression in cyanobacteria of chimeric gene encoding insecticidally active protein, or convey to those of ordinary skill reasonable expectation of success in doing so; expression of antibiotic resistance-conferring genes in cyanobacteria, without more, does not render obvious expression of unrelated genes in cyanobacteria for unrelated purposes.

3. Patentability/Validity — Specification — Enablement (§115.1105)

JUDICIAL PRACTICE AND PROCEDURE

Procedure — Judicial review — Standard of review — Patents (§410.4607.09)

Specification must, in order to be enabling

cts so that they can be positioned to the general market at the end of the relevant patents. At least for relative, all start-up companies like Ventriplex, much of the business and technical essential to survival is done by a small of people, the promise by Congress of have could prove to be completely if the courts permitted competitors exceed full bore with expensive, resourceing, and personnel-distracting litigation e form of actions for declaratory relief. e little sense, and thus we assume d be inconsistent with Congress' intent, oect companies like Ventriplex from suit actual patent infringement but leave fully exposed to declaratory relief ac; whose gravamen and burdens are much ame. While the considerations discussed re preceding paragraph are sufficient to ort our decision not to exercise jurisdiction at this time over plaintiff's declaratory if counts, the fact that these additional cy considerations cut in the same direction intensifies our resolve. or all the reasons discussed in this section, we hereby GRANT defendants' motion miss plaintiff's declaratory relief claims ounts VIII and IX). These Counts are DERED dismissed.

DEFENDANTS' MOTION TO DISMISS THE REMAINING STATE LAW CLAIMS (COUNTS X-XIX)

Defendants earlier moved this court to miss plaintiff's state law claims asserted Counts X - XVII of plaintiff's original nplaint. Defendants contended that, since sole basis of subject matter jurisdiction or these claims was pendency to the federal question claims in Counts I-IX, the court ould dismiss the state law claims if it ants defendants' motion to dismiss the federal law claims in counts I-IX.

However, plaintiff has since amended its mplaint. The second amended complaint w alleges a separate basis for jurisdiction nder 28 U.S.C. §1332(a) (diversity). Plaintiff also has added two new counts, including an additional federal claim (Count XVIII — orrection of inventorship) that is not dis- xed of by our ruling on the applicability of e 271(e)(1) defense. Thus, we hereby ENY defendants' motion to dismiss plain- ff's state law claims.

1. CONCLUSION

Given the dispositive effect of the 71(e)(1) defense on Counts I-IX of plain- if's second amended complaint, this court

invention without "undue experimentation," which does not preclude some experimentation; enablement is question of law which is reviewed independently on appeal, although such determination is based upon underlying factual findings which are reviewed for clear error.

PATENTS

4. Patentability/Validity — Specification — Enablement (§115.1105)

Patent and Trademark Office did not err in rejecting, as non-enabling pursuant to 35 USC 112, first paragraph, claims for use of genetic engineering techniques for producing proteins that are toxic to insects such as larvae of mosquitoes and black flies, in view of relatively incomplete understanding of biology of cyanobacteria as of applicants' filing date, as well as limited disclosure by applicants of particular cyanobacterial genera operative in claimed invention, since there is no reasonable correlation between narrow disclosure in applicants' specification and broad scope of protection sought in claims encompassing gene expression in any and all cyanobacteria.

Appeal from the U.S. Patent and Trademark Office, Board of Patent Appeals and Interferences.

Application for patent, serial no. 07/021,405, filed March 4, 1987, by Mark A. Vaack, Wipa Chungiatupornchai, and Lee McIntosh (hybrid genes incorporating a DNA fragment containing a gene coding for an insecticidal protein, plasmids, transformed cyanobacteria expressing such protein and method for use as a biocontrol agent). From decision rejecting claims 1-48 and 50-52 as unpatentable under 35 USC 103, and rejecting claims 1-48 and 50-51 for lack of enablement, applicants appeal. Affirmed and part and reversed in part; Mayer, J., dissents with opinion.

Ian C. McLeod, Okemos, Mich., appellant.

Teddy S. Gron, associate solicitor (Fred E. McKelvey, solicitor and Richard E. Schafer, associate solicitor, with him on brief), for appellee.

Before Rich, Archer, and Mayer, circuit judges.

BACKGROUND

A. The Invention

The claimed invention is directed to the use of genetic engineering techniques¹ for production of proteins that are toxic to insects such as larvae of mosquitoes and black flies. These swamp-dwelling pests are the source of numerous human health problems, including malaria. It is known that certain species of the naturally-occurring *Bacillus* genus of bacteria produce proteins ("endotoxins") that are toxic to these insects. Prior art methods of combating the insects involved spreading or spraying crystalline spores of the insecticidal *Bacillus* proteins over swamps. The spores were environmentally unstable, however, and would often sink to the bottom of a swamp before being consumed, thus rendering this method prohibitively expensive. Hence the need for a lower-cost method of producing the insecticidal *Bacillus* proteins in high volume, with application in a more stable vehicle.

As described by appellants, the claimed subject matter meets this need by providing for the production of the insecticidal *Bacillus* proteins within host cyanobacteria. Although both cyanobacteria and bacteria are members of the procaryote² kingdom, the

¹ Basic vocabulary and techniques for gene cloning and expression have been described in *In re O'Farrell*, 853 F.2d 894, 895-99, 7 USPQ2d 1673, 1674-77 (Fed. Cir. 1988), and are not repeated here.

² All living cells can be classified into one of two broad groups, procaryotes and eucaryotes. The procaryotes comprise organisms formed of cells that do not have a distinct nucleus; their DNA floats throughout the cellular cytoplasm. In contrast, the cells of eucaryotic organisms such as man, other animals, plants, protozoa, algae and yeast have a distinct nucleus wherein their DNA

acteria (which in the past have been called as "blue-green algae") are unique prokaryotes in that the cyanobacteria are capable of oxygenic photosynthesis. The bacteria grow on top of swamps where they are consumed by mosquitos and black flies, when *Bacillus* proteins are produced within transformed cyanobacterial cells according to the claimed invention, the use of the insecticide in the food of the insected insects advantageously guarantees uptake by the insects.

More particularly, the subject matter of the application on appeal includes a chimeric (hybrid) gene comprising (1) a gene from a bacterium of the *Bacillus* genus whose product is an insecticidal protein, and (2) a DNA promoter effective for expressing the *Bacillus* gene in a cyanobacterium, so as to produce the insecticidal protein.

The claims on appeal are 1-48 and 50-52, claims remaining in the application. Claim 1 reads:

A chimeric gene capable of being expressed in Cyanobacteria cells comprising: a DNA fragment comprising a promoter region which is effective for expression of a DNA fragment in a Cyanobacterium; and at least one DNA fragment coding for an insecticidally active protein produced by a *Bacillus* strain, or coding for an insecticidally active truncated form of the above protein or coding for a protein having substantial sequence homology to the above protein,

the DNA fragments being linked so that the gene is expressed.

Claims 2-15, which depend from claim 1, recite preferred *Bacillus* species, promoters, and selectable markers. Independent claim 17 and claims 17-31 which depend therefrom are directed to a hybrid plasmid vector which

"Transformed" cyanobacteria are those that successfully taken up the foreign *Bacillus* DNA such that the DNA information has become a permanent part of the host cyanobacteria, be replicated as new cyanobacteria are generated.

"Expression" of a gene refers to the production of the protein which the gene encodes; more specifically, it is the process of transferring information from a gene (which consists of DNA) via messenger RNA to ribosomes where a specific protein is made.

In the context of the claimed invention, "selectable markers" or "marker genes" refer to antibiotic-resistance conferring DNA fragments, which are being expressed, which fa-

includes the chimeric gene of claim 1. Claim 32 recites a bacterial strain. Independent claim 33 and claims 34-48 which depend therefrom recite a cyanobacterium which expresses the chimeric gene of claim 1. Claims 50-51 recite an insecticidal composition. Claim 52 recites a particular plasmid that appellants have deposited.

B. Appellants' Disclosure

In addition to describing the claimed invention in generic terms, appellants' specification discloses two particular species of *Bacillus* (*B. thuringiensis*, *B. sphaericus*) as sources of insecticidal protein; and nine genera of cyanobacteria (*Synechocystis*, *Anabaena*, *Synechococcus*, *Agmenellum*, *Aphanocapsa*, *Gloeocapsa*, *Nostoc*, *Anabaena* and *Fremyella*) as useful hosts.

The working examples relevant to the claims on appeal detail the transformation of a single strain of cyanobacteria, i.e., *Synechocystis* 6803. In one example, *Synechocystis* 6803 cells are transformed with a plasmid comprising (1) a gene encoding a particular insecticidal protein ("B.t. 8") from *Bacillus thuringiensis* var. *israelensis*, linked to (2) a particular promoter, the PL promoter from the bacteriophage Lambda (a virus of *E. coli*). In another example, a different promoter, i.e., the *Synechocystis* 6803 promoter for the rubisco operon, is utilized instead of the Lambda PL promoter.

C. The Prior Art

A total of eleven prior art references were cited and applied, in various combinations, against the claims on appeal.

The focus of Dzelzkalns' the primary reference cited against all of the rejected claims, is to determine whether chloroplast promoter sequences can function in cyanobacteria. To that end Dzelzkalns discloses the expression in cyanobacteria of a chimeric gene comprising a chloroplast promoter sequence fused to a gene encoding the enzyme chloramphenicol acetyl transferase (CAT). Importantly, Dzelzkalns teaches the use of the CAT gene as a "marker" gene; the use of antibiotic resistance-conferring genes for selection purposes is a common technique in genetic engineering.

¹² *Nucleic Acids Res.* 8917 (1984).
Chloramphenicol is an antibiotic; CAT is an enzymatic marker.

Sekar I,¹ Sekar II,² and Ganesan¹⁰ collectively disclose expression of genes encoding certain *Bacillus* insecticidal proteins in the bacterial hosts *B. megaterium*, *B. subtilis* and *E. coli*.

Friedberg¹¹ discloses the transformation of the cyanobacterium *Anacystis nidulans* R2 by a plasmid vector comprising the O₂ PL operator-promoter region and a temperature-sensitive repressor gene of the bacteriophage Lambda. While the cyanobacteria are attractive organisms for the cloning of genes involved in photosynthesis, Friedberg states, problems may still be encountered such as suboptimal expression of the cloned gene, detrimental effects on cell growth of overexpressed, highly hydrophobic proteins, and rapid turnover of some gene products. To address these problems, Friedberg teaches the use of the disclosed Lambda regulatory signals in plasmid vehicles which, in its states, have "considerable potential for use as vectors the expression of which can be controlled in *Anacystis*."

Miller¹² compares the initiation specificities *in vitro* of DNA-dependent RNA polymerases¹³ purified from two different species of cyanobacteria (*Fremyella diplosiphon* and *Anacystis nidulans*), as well as from *E. coli*.

Nierzwicki-Bauer¹⁴ identifies in the cyanobacterium *Anabaena* 7120 the start site for transcription of the gene encoding *rbcl*, the large subunit of the enzyme ribulose-1, 5-bisphosphate carboxylase. It reports that the nucleotide sequence 14-8 base pairs preceding the transcription start site "resembles a good *Escherichia coli* promoter," but that the sequence 35 base pairs before the start site does not.

Chauvat¹⁵ discloses host-vector systems for gene cloning in the cyanobacterium *Synechocystis* 6803, in which the antibiotic resistance-conferring *neo* gene is utilized as a selectable marker.

¹³ *Biochem. and Biophys. Res. Comm.* 748 (1986).
¹⁴ *Gene* 151 (1985).

¹⁵ *Mol. Gen. Genet.* 181 (1983).

¹⁶ *Mol. Gen. Genet.* 505 (1986).

¹⁷ *J. Bacteriology* 246 (1979).

¹⁸ RNA polymerase, the enzyme responsible for making RNA from DNA, binds at specific nucleotide sequences (promoters) in front of genes in DNA, and then moves through the gene making an RNA molecule that includes the information contained in the gene. Initiation specificity is the ability of the RNA polymerase to initiate this process specifically at a site(s) on the DNA template.

¹⁹ *Proc. Natl. Acad. Sci. USA* 5961 (1984).

²⁰ *Proc. Natl. Acad. Sci. USA* 195 (1984).

Reiss¹⁶ studies expression in *E. coli* of various proteins formed by fusion of certain foreign DNA sequences with the *neo* gene. Kolowsky¹⁷ discloses chimeric plasmids designed for transformation of the cyanobacterium *Synechococcus* R2, comprising an antibiotic-resistant gene linked to chromosomal DNA from the *Synechococcus* cyanobacterium.

Barnes, United States Patent No. 4,695,455, is directed to the treatment with stabilizing chemical reagents of pesticides produced by expression of heterologous genes (such as those encoding *Bacillus* proteins) in host microbial cells such as *Pseudomonas* bacteria. The host cells are killed by this treatment, but the resulting pesticidal compositions exhibit prolonged toxic activity when exposed to the environment of target pests.

D. The Grounds of Rejection

1. The § 103 Rejections

Claims 1-6, 16-21, 33-38, 47-48 and 52 (which include all independent claims in the application) were rejected as unpatentable under 35 USC 103 based upon Dzelzkalns in view of Sekar I or Sekar II and Ganesan. The examiner stated that Dzelzkalns discloses a chimeric gene capable of being highly expressed in a cyanobacterium, said gene comprising a promoter region effective for expression in a cyanobacterium operably linked to a structural gene encoding CAT. The examiner acknowledged that the chimeric gene and transformed host of Dzelzkalns differ from the claimed invention in that the former's structural gene encodes CAT rather than insecticidally active protein. However, the examiner pointed out, Sekar I, Sekar II, and Ganesan teach genes encoding insecticidally active proteins produced by *Bacillus*, and the advantages of expressing such genes in heterologous hosts to obtain larger quantities of the protein. The examiner contended that it would have been obvious to one of ordinary skill in the art to substitute the *Bacillus* genes taught by Sekar I, Sekar II, and Ganesan for the CAT gene in the vectors of Dzelzkalns in order to obtain high level expression of the *Bacillus* genes in the transformed cyanobacteria. The examiner further contended that it would have been obvious to use cyanobacteria as heterologous hosts for expression of the claimed genes due to the ability of cyanobacteria to serve as transformed hosts for the

¹¹ *Gene* 211 (1984).

¹² *Gene* 289 (1984).

¹³ Denotes different species or organism.

[2] We agree with appellants that the PTO has not established the prima facie obviousness of the claimed subject matter. The prior art simply does not disclose or suggest the expression in cyanobacteria of a chimeric gene encoding an insecticidally active protein, or convey to those of ordinary skill a reasonable expectation of success in doing so. More particularly, there is no suggestion in Dzelzkalns, the primary reference cited against all claims, of substituting in the disclosed plasmid a structural gene encoding *Bacillus* insecticidal proteins for the CAT gene utilized for selection purposes. The expression of antibiotic resistance-conferring genes in cyanobacteria, without more, does not render obvious the expression of unrelated genes in cyanobacteria for unrelated purposes.

The PTO argues that the substitution of insecticidal *Bacillus* genes for CAT marker genes in cyanobacteria is suggested by the secondary references Sekar I, Sekar II, and Ganesan, which collectively disclose expression of genes encoding *Bacillus* insecticidal proteins in two species of host *Bacillus* bacteria (*B. megaterium* and *B. subtilis*) as well as in the bacterium *E. coli*. While these references disclose expression of *Bacillus* genes encoding insecticidal proteins in certain transformed bacterial hosts, nowhere do these references disclose or suggest expression of such genes in transformed cyanobacterial hosts.

To remedy this deficiency, the PTO emphasizes similarity between bacteria and cyanobacteria, namely, that these are both prokaryotic organisms, and argues that this fact would suggest to those of ordinary skill the use of cyanobacteria as hosts for expression of the claimed chimeric genes. While it is true that bacteria and cyanobacteria are now both classified as prokaryotes, that fact alone is not sufficient to motivate the art worker as the PTO contends. As the PTO concedes, cyanobacteria and bacteria are not identical; they are classified as two separate divisions of the kingdom Prokaryotae.¹¹ Moreover, it is only in recent years that the biology of cyanobacteria has been clarified, as evidenced by references in the prior art to "blue-green algae." Such evidence of recent uncertainty regarding the biology of cyano-

¹¹ *Siedman's Medical Dictionary* 1139 (24th ed. 1982) (definition of "Prokaryotae"). Prokaryotic organisms are commonly classified according to the following taxonomic hierarchy: Kingdom; Division; Class; Order; Family; Genus; Species. 3 *Bergey's Manual of Systematic Bacteriology*

claimed invention, in view of the unpredictability in the art, the breadth of the claims, and the limited number of working examples and the limited guidance provided in the specification. With respect to unpredictability, the examiner stated that

[t]he cyanobacteria comprise a large and diverse group of photosynthetic bacteria including large numbers of species in some 150 different genera including *Synechocystis*, *Anacystis*, *Synechococcus*, *Agmenellum*, *Nostoc*, *Anabaena*, etc. The molecular biology of these organisms has only recently become the subject of intensive investigation and this work is limited to a few genera. Therefore the level of unpredictability regarding heterologous gene expression in this large, diverse and relatively poorly studied group of prokaryotes is high. . . .

The Board affirmed, noting that "the limited guidance in the specification, considered in light of the relatively high degree of unpredictability in this particular art, would not have enabled one having ordinary skill in the art to practice the broad scope of the claimed invention without undue experimentation." *In re Fisher*, 427 F.2d 833, 166 USPQ 18 (CCPA 1970)."

OPINION

A. Obviousness

We first address whether the PTO erred in rejecting the claims on appeal as prima facie obvious within the meaning of 35 USC 103. Obviousness is a legal question which this court independently reviews, though based upon underlying factual findings which we review under the clearly erroneous standard. *In re Woodruff*, 919 F.2d 1575, 1577, 16 USPQ2d 1934, 1935 (Fed. Cir. 1990).

[1] Where claimed subject matter has been rejected as obvious in view of a combination of prior art references, a proper analysis under § 103 requires, *inter alia*, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success. See *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988). Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the appli-

cation of heterogeneous genes. In the absence of evidence to the contrary, the examiner contended, the invention as a whole was *na facie* obvious.

Additional rejections were entered against groups of dependent claims which we do not address here. All additional rejections were made in view of Dzelzkalns in combination with Sekar I, Sekar II, and Ganesan, and further in view of other references discussed in Part C above.

The Board affirmed the § 103 rejections, initially adopting the examiner's answer as opinion while adding a few comments. A legal conclusion of obviousness does not require absolute certainty, the Board added, only a reasonable expectation of success, *In re O'Farrell*, 853 F.2d 894, 7 USPQ2d 1673 (Fed. Cir. 1988). In view of disclosures of the prior art, the Board included, one of ordinary skill in the art would have been motivated by a reasonable expectation of success to make the substitution suggested by the examiner.

2. The § 112 Rejection

The examiner also rejected claims 1-48 under 35 USC 112, first paragraph, on the ground that the disclosure was enabling only for claims limited in accordance with the specification as filed. Citing *Manual of Patent Examining Procedure* (MPEP) provisions 706.03(n)¹² and (z)¹³ as support, the examiner took the position that undue experimentation would be required of the art worker to practice the

¹² MPEP 706.03(n), "Correspondence of claim and disclosure," provides in part:

In chemical cases, a claim may be so broad as to not be supported by [the] disclosure, in which case it is rejected as unwarranted by the disclosure. . . .

¹³ MPEP 796.03(z), "Undue Breadth," provides in part:

[I]n applications directed to intentions in arts where the results are unpredictable, the disclosure of a single species usually does not provide an adequate basis to support generic claims. *In re Sol*, 1938 C.D. 723; 497 O.G. 546. This is because in arts such as chemistry it is not obvious from the disclosure of one species, what other species will work. *In re Dreschfeld*, 1940 C.D. 351; 518 O.G. 255 gives this general rule: "It is well settled that in cases involving chemicals and chemical compounds, which differ radically in their properties it must appear in an applicant's specification either by the enumeration of a sufficient number of the members of a group or by other appropriate language, that the chemicals or chemical compounds in the claims are capable of

bacteria tends to rebut, rather than support, the PTO's position that one would consider the cyanobacteria effectively interchangeable with bacteria as hosts for expression of the claimed gene.

At oral argument the PTO referred to additional secondary references, not cited against any independent claim (i.e., Friedberg, Miller, and Nierzwicki-Bauer), which it contended disclose certain amino acid sequence homology between bacteria and cyanobacteria. The PTO argued that such homology is a further suggestion to one of ordinary skill to attempt the claimed invention. We disagree. As with the Dzelzkalns, Sekar I, Sekar II, and Ganesan references discussed above, none of these additional references disclose or suggest that cyanobacteria could serve as hosts for expression of genes encoding *Bacillus* insecticidal proteins. In fact, these additional references suggest as much about *differences* between cyanobacteria and bacteria as they do about similarities. For example, Nierzwicki-Bauer reports that a certain nucleotide sequence (i.e., the -10 consensus sequence) in a particular cyanobacterium resembles an *E. coli* promoter, but that another nearby nucleotide sequence (the -35 region) does not. While Miller speaks of certain promoters of the bacteriophage Lambda that are recognized by both cyanobacterial and *E. coli* RNA polymerases, it also discloses that these promoters exhibited differing strengths when exposed to the different polymerases. Differing sensitivities of the respective polymerases to an inhibitor are also disclosed, suggesting differences in the structures of the initiation complexes.

The PTO asks us to agree that the prior art would lead those of ordinary skill to conclude that cyanobacteria are attractive hosts for expression of any and all heterologous genes. Again, we can not. The relevant prior art does indicate that cyanobacteria are attractive hosts for expression of both native and heterologous genes *involved in photosynthesis* (not surprisingly, for the capability of undergoing oxygenic photosynthesis is what makes the cyanobacteria unique among prokaryotes). However, these references do not suggest that cyanobacteria would be equally attractive hosts for expression of *unrelated* heterologous genes, such as the claimed genes encoding *Bacillus* insecticidal proteins.

In *O'Farrell*, this court affirmed an obviousness rejection of a claim to a method for

producing a "predetermined protein in a stable form" in a transformed bacterial host. 3 F.2d at 895, 7 USPQ2d at 1674. The references included a prior art publication (the Polisky reference) whose three authors included two of the three coinventors. The main difference between the prior art and the claim at issue was that in Polisky, the heterologous gene was a gene for ribosomal RNA, while the claimed invention substituted a gene coding for a predetermined protein. *Id.* at 901, 7 USPQ2d at 179. Although, as the appellants therein pointed out, the ribosomal RNA gene is not normally translated into protein, Polisky mentioned preliminary evidence that the transcript of the ribosomal RNA gene was translated into protein, and further predicted that if a gene coding for a protein were to be substituted, extensive translation might result. *Id.* We thus affirmed, explaining that the prior art explicitly suggested the substitution that is the difference between the claimed invention and the prior art, and presented preliminary evidence suggesting that the [claimed] method could be used to make proteins.

... Polisky contained detailed enabling methodology for practicing the claimed invention, a suggestion to modify the prior art to practice the claimed invention, and evidence suggesting that it would be successful. *Id.* at 901-02, 7 USPQ2d at 1679-80. In contrast with the situation in *O'Farrell*, the prior art in this case offers no suggestion, explicit or implicit, of the substitution that is the difference between the claimed invention and the prior art. Moreover, the "reasonable expectation of success" that was present in *O'Farrell* is not present here. Accordingly, we reverse the § 103 rejections.

B. Enablement

[3] The first paragraph of 35 USC 112 requires, *inter alia*, that the specification of a patent enable any person skilled in the art to which it pertains to make and use the claimed invention. Although the statute does not say so, enablement requires that the specification teach those in the art to make and use the invention without "undue experimentation." *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988).

cation).²² Accordingly, we affirm the § 112 rejection as to those claims.

In so doing we do not imply that patent applicants in art areas currently dominated as "unpredictable" must never be allowed generic claims encompassing more than the particular species disclosed in their specification. It is well settled that patent applicants are not required to disclose every species encompassed by their claims, even in an unpredictable art. *In re Angstadt*, 537 F.2d 498, 502-03, 190 USPQ 214, 218 (CCPA 1976). However, there must be sufficient disclosure, either through illustrative examples or terminology,²³ to teach those of ordinary skill how to make and how to use the invention as broadly as it is claimed. This means that the disclosure must adequately guide the art worker to determine, without undue experimentation, which species among all those encompassed by the claimed genus possess the disclosed utility. Where, as here, a claimed genus represents a diverse and relatively poorly understood group of microorganisms, the required level of disclosure will be greater than, for example, the disclosure of an invention involving a "predictable" factor such as a mechanical or electrical element. See *Fisher*, 427 F.2d at 839, 166 USPQ at 24. In this case, we agree with the PTO that appellants' limited disclosure does not enable one of ordinary skill to make and use the invention as now recited in claims 1-46 and 50-51 without undue experimentation.

Remaining dependent claim 47 recites a cyanobacterium which expresses the chimera gene of claim 1, wherein the cyanobacteri-

²² The enablement rejection in this case was not based upon a post-filing date state of the art, as in *In re Hogan*, 559 F.2d 595, 605-07, 194 USPQ 527, 536-38 (CCPA 1977). See also *United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247, 1251, 9 USPQ2d 1461, 1464 (Fed. Cir. 1989) (citing *Hogan*); *Hormone Research Found., Inc. v. Genentech, Inc.*, 904 F.2d 1558, 1568-69, 15 USPQ2d 1039, 1047-48 (Fed. Cir. 1990) (directing district court, on remand, to consider effect of *Hogan* and *United States Steel* on the enablement analysis of *Fisher*), cert. dismissed, *U.S.* 111 S. Ct. 1434 (1991). We therefore do not consider the effect of *Hogan* and its progeny on *Fisher*'s analysis of when an inventor should be allowed to "dominate the future patentable inventions of others." *Fisher*, 427 F.2d at 839, 166 USPQ at 24. ²³ The first paragraph of § 112 requires nothing more than objective enablement. *In re Marzocchi*, 439 F.2d 220, 223, 169 USPQ 367, 369 (CCPA 1971). How such a teaching is set forth, either by the use of illustrative examples or

um is selected from among the genera *Anaerobaculum* and *Synechocystis*. Claim 48, which depend from claim 47, is limited to the cyanobacterium *Synechocystis* 6803. The PTO did not separately address these claims, nor indicate why they should be treated in the same manner as the claims encompassing all types of cyanobacteria. Although these claims are not limited to expression of genes encoding particular *Bacillus* proteins, we note what appears to be an extensive understanding in the prior art of the numerous *Bacillus* proteins having toxicity to various insects. The rejection of claims 47-48 under § 112 will not be sustained.

CONCLUSION

The rejection of claims 1-48 and 50-52 under 35 USC 103 is reversed. The rejection of claims 1-46 and 50-51 under 35 USC 112, first paragraph, is affirmed and the rejection of claims 47 and 48 thereunder is reversed. AFFIRMED-IN-PART, REVERSED-IN-PART

Mayer, J., dissenting.

An appeal is not a second opportunity to try a case or prosecute a patent application, and we should not allow parties to "undertake to retry the entire case on appeal." *Perini America, Inc. v. Paper Converting Machine Co.*, 832 F.2d 581, 584, 4 USPQ2d 1621, 1624 (Fed. Cir. 1987); *Eaton Corp. v. Appliance Valves Corp.*, 790 F.2d 874, 877, 229 USPQ 668, 671 (Fed. Cir. 1986). But that is precisely what the court has permitted here. The PTO conducted a thorough examination of the prior art surrounding this patent application and concluded the claims would have been obvious. The board's decision based on the examiner's answer which comprehensively explains the rejection is persuasive and shows how the evidence supports the legal conclusion that the claims would have been obvious. Yet, the court ignores all this and conducts its own examination, if you will, as though the examiner and board did not exist. Even if I thought this opinion were more persuasive than the board's, I could not join it because it misperceives the role of the court.

The scope and content of the prior art, the similarity between the prior art and the claims, the level of ordinary skill in the art, and what the prior art teaches are all questions of fact. *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966); *Jurgens v. McKasy*, 927 F.2d 1552, 1560, 18 USPQ2d 1031, 1037 (Fed. Cir. 1991). And [t]here there are two permissible views of

International Trade Commission abused its discretion by refusing to release bond posted by respondent to 19 USC 1337 complaint in compliance with temporary cease and desist order, even though respondent made sales of infringing product during effective period of order, since complainant authorized sales in question and agreed to return of bond as part of settlement agreement with respondent, since bond provisions, under terms of order, do not apply to sales authorized by complainant, and since public interest in vindicating rights of patentees, as well as complainant's interest in offsetting competitive advantage respondent obtained

This appeal stems from an investigation begun by the Commission in response to a complaint and motion for temporary relief filed by the Bristol-Myers Company¹ on February 1, 1989. In the complaint, Bristol

United Mues Company has since be-

Order. (Emphasis added). Paragraph XI further stated the conditions for forfeiture or release of the bond.⁷ The conduct specifically al-

The bond is to be forfeited in the event that the President approves, or does not disapprove within the Presidential review period, the Commission's Orders of January 10, 1990, or any

Subsequently, on April 23, 1990, Biocraft of a settlement with Biocrate. Pursuant to the settlement agreement, Bristol submitted a letter joining Biocraft's petition. The Commission investigative attorney opposed the petition.

tion of Investigation No. 337-TA-293, unless the U.S. Court of Appeals for the Federal Circuit, in a final judgment, reverses any Commission final determination and order as to Respondent on appeals or unless Respondent exports the products subject to this bond or destroys them and provides certification to that effect satisfactory to the Commission.

President disapproves this Order and no subsequent order is issued by the Commission and approved or not disapproved by the President, upon service on Respondent of an Order issued by the Commission based upon application therefor made by Respondent to the Commission.

Court of Appeals, Federal Circuit

In re Fritch

No. 91-1318

Decided August 11, 1992

DICIAL PRACTICE AND OCEDURE

Procedure — Judicial review — Standard of review — Patents (§410.4607.09)

Obviousness determination is based on underlying factual inquiries concerning invention and prior art, which are reviewed for clear error on appeal, but ultimate conclusion of obviousness is reviewed matter of law.

TENTS

Patent construction — Claims — Broad or narrow (§125.1303)

Prior art patent for grass edging and tending device cannot be held to teach that device is flexible and conformable to ground its entirety, since base portion of device includes prominent anchoring leg which would inhibit longitudinal flexibility, and vice patent's express teaching that trench is necessary to install device in harder ground shows that it is not freely conformable *creto*.

Patentability/Validity — Obviousness — Relevant prior art — Particular inventions (§115.0903.03)

Patentability/Validity — Obviousness — Combining references (§115.0905)

Claims for landscape edging device are *prima facie* obvious in view of combined teachings of two prior patents, since primary reference does not suggest overall flexibility and landscape retention function of claimed device, and since secondary reference does not, merely by virtue of flexibility of device described therein, suggest extensive modifications which would bring primary reference into conformity with application claims.

Patentability/Validity — Obviousness — Combining references (§115.0905)

Mere fact that prior art may be modified to reflect features of claimed invention does not make modification, and hence claimed invention, obvious unless desirability of such modification is suggested by prior art; claimed invention cannot be used as instructional manual or "template" to piece together teachings of prior art so that claimed invention is rendered obvious.

Appeal from the U.S. Patent and Trademark Office, Board of Patent Appeals and Interferences.

Patent application of John R. Fritch (serial no. 06/838,721, landscape apparatus and method). From decision upholding rejection of application claims 1-7, 9-24, 29 and 30, applicant appeals. Reversed.

Charles L. Gholz, of Oblon, Spivak, McClelland, Maier & Neustadt, Arlington, Va. (John R. Fritch, Corpus Christi, Texas, on brief), for appellant.

Jameson Lee, associate solicitor (Fred E. McKelvey, solicitor, with him on brief; Richard E. Schafer, of counsel), for appellee.

Before Smith, senior circuit judge, and Plager and Rader, circuit judges.

Smith, J.

John R. Fritch (Fritch) appeals the 27 February 1991 decision of the Patent and Trademark Office Board of Patent Appeals and Interferences (Board) affirming-in-part the Examiner's final rejection of the remaining claims in Fritch's application entitled Landscape Edging Apparatus and Method.¹ The Examiner concluded that Fritch's invention would have been obvious to one of ordinary skill in the art and was therefore unpatentable under 35 U.S.C. § 103. The Board, except for allowing claim 28, agreed. The Board's decision is reversed.

Issue

The issue is whether the Board erred in affirming the Examiner's determination that the prior art references of Wilson and Hendrix rendered the subject matter of Fritch's independent claims 1, 13, 24, and 29 obvious to one of ordinary skill in the art.

Background

In his final rejection, the Examiner rejected claims 1-24 and 27-30 of Fritch's application as unpatentable for obviousness under 35 U.S.C. § 103. Fritch appealed the final rejection to the Board. The Board affirmed the rejection as to claims 1-24, 29 and 30, entered a new ground of rejection for claim 27, and reversed as to claim 28. The Board agreed with the Examiner that the teachings of the Wilson and Hendrix patents rendered

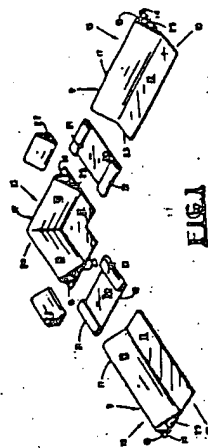
the subject matter of independent claims 1, 13, 24, and 29 obvious to one of ordinary skill in the art. Fritch does not appeal the Board's disposition as to claims 27 and 28, and at oral argument withdrew the appeal as to claim 8. The claims remaining in this appeal are 1-7, 9-24, 29 and 30.

The Fritch Invention

The invention claimed by Fritch involves a landscape edging device which includes a planar base portion and an upwardly extending retainer portion. The base portion is elongate, thin, flexible and has a planar bottom surface conformable to a varying slope ground surface. One longitudinal edge of the base portion serves as a mowing strip and the other serves as a retaining flange for landscape fill. The upwardly extending retainer portion is integrally connected (e.g., fused) to the base portion and defines a longitudinally extending enclosed space. The Fritch invention is intended to be used as a retainer for landscape fill in order to separate unmowable landscape fill from the mowable lawn. It may also be used to secure a landscaping sheet to the ground, or to function as guards at the base of a fence. Independent claims 1 and 13 on appeal are representative of the subject matter claimed:

1. A landscape edging strip formed in its entirety of a thin gauge, flexible material and conformable to a ground surface of varying slope, comprising a continuous elongate, thin gauge, flexible base portion having a planar bottom surface conformable to said varying slope ground surface; a thin gauge, elongate retainer portion integral with said base portion and extending upwardly therefrom and transversely thereto to overlie a portion of said base portion; all of said retainer portion defining a longitudinally extending enclosed space; said retainer portion being integrally connected to said base portion adjacent one longitudinal edge of said base portion to define a mowing strip adjacent the other longitudinal edge of said base portion.

13. A landscape edging strip formed in its entirety from thin gauge, flexible material and conformable to a ground surface of varying slope, comprising a continuous elongate, thin gauge, flexible base portion having a planar bottom surface conformable to said varying slope ground surface; a thin gauge, elongate retainer portion



The Prior Art
a. The Wilson Patent

The Wilson patent relied upon by the Examiner and the Board is entitled "Grass Edging and Watering Device". The embodiment of the Wilson device includes a substantially flat mowing strip extending horizontally from a longitudinally extending body portion. Opposite the mowing strip is a scored flange which may be broken off when not needed or wanted. Between the mowing strip and the flange, and extending vertically from the body portion is an anchoring leg. Located above the anchoring leg is the body portion which contains a water conduit and sprinkler head assembly. The device is intended to be used adjacent to the borders of walks and plant beds. Figures 1 and 4 from Wilson's drawings are reproduced below:

¹ Perkin Elmer Corp. v. Computervision Corp., 732 F.2d 888, 896, 221 USPQ 669, 675 (Fed. Cir. 1984).
² U.S. Patent No. 3,485,449.

The Board's holding that Wilson is flexible in its entirety is based upon a misapprehension of the scope of Wilson's teachings.

Second, Wilson's anchoring leg prohibits conformity to the ground surface in the manner claimed by Fritch. The Examiner's description of Wilson as having a "planar bottom surface conformable to a varying slope surface" is applicable *only* in reference to the mower strip. This description, however, ignores the anchor leg and the fact that it must be placed *into* the ground. Wilson expressly teaches that the anchoring leg may be pushed into soft soils, but in harder terrain a trench is needed in order to place the Wilson sprinkler system. In order to install the Wilson apparatus, the ground surface must be altered to conform to the device rather than, as the Solicitor contends, that Wilson is freely conformable to the ground. Fritch, on the other hand, does not require such extensive alteration of the ground surface in order to install the device.

Prima Facie Obviousness

In proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a prima facie case of obviousness based upon the prior art. "[The Examiner] can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references." The patent applicant may then attack the Examiner's prima facie determination as improperly made out, or the applicant may present objective evidence tending to support a conclusion of nonobviousness.

Fritch has attacked the Board's finding that the Examiner established that Fritch's claimed invention was prima facie obvious in view of the teachings of the prior art. The Board states that "a collective evaluation of the Wilson and the Hendrix patents would have rendered the subject matter of independent claims 1, 13, 24, and 29 obvious to one of ordinary skill." Fritch maintains that there is no teaching, suggestion, or incentive in the prior art to modify or to combine the

teachings of the prior art in the manner suggested by the Examiner. We agree.

[3] Wilson teaches a grass edging and watering device which includes an anchoring leg for securing the device to the ground. Wilson contemplates that a trench will need to be dug in order to allow the anchoring leg to be placed into the ground if the condition of the soil requires it. This anchoring leg prohibits flexibility and conformability over the length of Wilson. Any flexibility or conformability in Wilson, which the Board states extends to the entire device, is limited to the mower strip. It is only the mower strip that is mentioned as being flexible in order to aid installation. Hendrix has been cited for its teaching of a flexible retainer strip that is able to conform to the ground surface.

Wilson addresses the problems of arresting growth of grass between areas and watering plants without wetting sidewalks. Wilson lacks any suggestion or incentive to use its water conduit as a landscape retainer since this would arguably result in clogged sprinkler heads.¹² Wilson also teaches that its mower strip is flexible in order to allow dirt to be packed thereunder. There is no suggestion in Wilson to extend that flexibility to the entire device. Wilson also lacks any teaching or suggestion that one should remove the anchoring leg. Hendrix does not, simply by virtue of its flexible nature, suggest these extensive changes which the Board states are obvious. Neither Wilson nor Hendrix, alone or in combination, provide any incentive to combine the teachings of the prior art in the manner maintained by the Board.

[4] "Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined *only* if there is some suggestion or incentive to do so." Although couched in terms of combining teachings found in the prior art, the same inquiry must be carried out in the context of a purported obvious "modification" of the prior art. The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested

¹² This court has previously found a proposed modification inappropriate for an obviousness inquiry when the modification rendered the prior art reference inoperable for its intended purpose. *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984).

¹³ *ACS Hosp. Systems, Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984).

¹ *In re Ptasceki*, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-88 (Fed. Cir. 1984).

² *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988) (citing *In re Lailu*, 747 F.2d 703, 705, 223 USPQ 1257, 1258 (Fed. Cir. 1988)).

³ *In re Heldt*, 433 F.2d 808, 811, 167 USPQ 676, 678 (CCPA 1970).

Standard of Review

[1] "[O]bviousness is a question of law to be determined from the facts."¹ The obviousness determination "is based upon underlying factual inquiries concerning the claimed invention and the prior art" which are reviewed for clear error.² However, it is the ultimate conclusion of obviousness which the Federal Circuit reviews as a matter of law.

Teachings of Wilson

Fritch takes exception to the Examiner's findings of fact related to the teachings of the Wilson patent. The Examiner's rejection and the Board's opinion rely heavily on the use of Wilson in view of other references to declare the Fritch invention obvious. The Board states that it agrees with the Examiner's finding of fact regarding the teachings of Wilson. In the Examiner's answer, which the Board quotes, the Wilson device is described as follows:

Wilson discloses a landscaping edging strip comprising a relatively thin gauge, elongated flexible base portion including a mower strip B having a planar bottom surface conformable to a varying slope surface.

The Board states that the Wilson reference presents "substantial evidence that Wilson is both thin and flexible." The Board regards the Wilson device as teaching that it is flexible and conformable in its entirety. This finding demonstrates clear error.

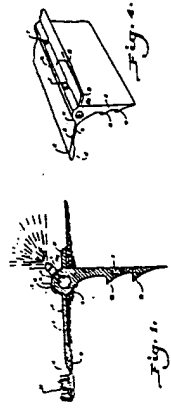
[2] It is well settled that a prior art reference is relevant for all that it teaches to those of ordinary skill in the art.³ The base portion of Wilson is not planar in its entirety, as the Board's opinion suggests, but also includes a prominent anchoring leg to secure the device to the ground. The anchoring leg, which runs the length of the Wilson device, would inhibit longitudinal flexibility of the Wilson device. Indeed, Wilson expressly contemplates flexibility and conformability *only* in the mower strip. Wilson states that its mower strip may be lifted in order to pack dirt thereunder for the purpose of securing the device to the ground. Fritch, on the other hand, is claimed to be flexible in its entirety.

¹ *In re De Blauwe*, 736 F.2d 699, 703, 222 USPQ 191, 195 (Fed. Cir. 1984).

² *In re Kulling*, 897 F.2d 1147, 1149, 14 USPQ2d 1056, 1057 (Fed. Cir. 1990).

³ *In re De Blauwe*, 736 F.2d at 703, 222 USPQ at 195.

⁴ *Beckman Instruments Inc. v. LKB Produkter AB*, 892 F.2d 1547, 1551, 13 USPQ2d 1301, 1304 (Fed. Cir. 1989).



b. The Hendrix Patent

The Hendrix patent is entitled "Loose Material Retainer Strip".⁴ The Solicitor chose not to discuss the Hendrix reference in his brief, stating that the Board had deemed Hendrix unnecessary to its decision. The Solicitor overstates the Board's position. The Board based its decision upon "a collective evaluation of the Wilson and Hendrix patents". We include Hendrix in our discussion because it did play a role in the rejection of Fritch's independent claims.

The Hendrix device is composed of elongated, flexible strips having substantially C-shaped cross-section. The bottom lip of the device is to be wider than the top lip in order to facilitate fastening the device to the ground. The device will fit most gently contours, and the top lip will yield laterally to build-up of gravel until the gravel can be redistributed. The concave portion of the strip is installed such that it faces the material to be retained in place. Hendrix contemplates that the retainer will be used in retaining gravel in driveways, lining flower beds, or on the shoulders of asphalt or concrete highways. Figure 1 of Hendrix's drawings is reproduced below:

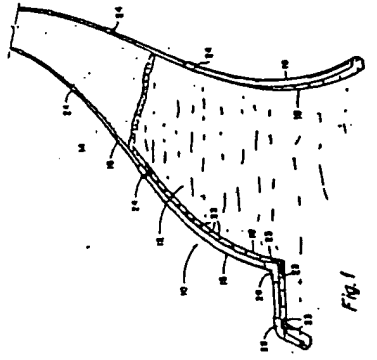


Fig. 1

Released June 25, 1992

TRADEMARKS AND UNFAIR TRADE PRACTICES

1. Acquisition, assignment, and maintenance of marks — Acquisition through use — Priority of use (§305.0503)

Practice and procedure in Patent and Trademark Office — Interpartes proceedings — Opposition and cancellation — In general (§325.0305.01)

Infringement; conflicts between marks — Likelihood of confusion — In general (§335.0301)

Opposer which uses mark "Rescue: 911" for its television show, which asserts that it has licensed use of mark on various merchandise items, and which seeks to oppose registration of "911 Rescue Bars" for candy bars, must clearly indicate in its pleading whether its claim of likelihood of confusion is based upon its services or its collateral merchandise, or both, and whether it claims priority of use of its mark on its collateral merchandise.

Conclusion

The decision of the Board affirming the Examiner's rejection of independent claims 1, 13, 24, and 29 of Fritch's application as unpatentable over the prior art under 35 U.S.C. § 103 is reversed. Since dependent claims are nonobvious if the independent claims from which they depend are nonobvious, the Board's affirmation of the rejection of dependent claims 2-7, 9-12, 14-23, and 30 is also reversed."

REVERSED

U.S. Patent and Trademark Office Trademark Trial and Appeal Board

CBS Inc. v. Mercandante

Nos. 85,324 and 85,330

Decided June 15, 1992

"In re Gordon, 733 F.2d at 902, 221 USPQ at 1127.

"In re Gorman, 933 F.2d 982, 987, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991). See also Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1138, 227 USPQ 543, 547 (Fed. Cir. 1985).

"In re Fine, 837 F.2d at 1075, 5 USPQ2d at 1600.

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911 RESCUE BAR¹ and 911 RESCUE BAR and design² for candy bars.

CBS Inc. opposed the registration of applicants' marks on the ground of priority of use and likelihood of confusion. Opposer claims use of the mark RESCUE: 911 as a service mark for a television program series since prior to May 31, 1990.³ Opposer has made the following allegations:

7. As a result of the tremendous popularity of Opposer's television program series "RESCUE: 911," Opposer has entered into several licensing arrangements and has licensed the use of its mark "RESCUE: 911" for various merchandise items, such as mugs, caps, T-shirts, sweatshirts, watches and toys.

8. Upon information and belief, Applicant has made no use in the United States of the mark "911 RESCUE BAR" prior to May 31, 1990.

9. Upon information and belief, the goods for which Applicant seeks to register its mark — candy bars — are related to those in connection with which Opposer has used its "RESCUE: 911" mark.

10. The dominant portion of Applicant's mark contains a word and number identical to the word and number comprising Opposer's mark, but in reverse order, and so resembles Opposer's "RESCUE: 911" mark, as to be likely when applied to the goods of the Applicant, to cause confusion, or to cause mistake or to deceive. As Applicant has disclaimed the exclusive right to use "BAR," it is evident that "911 RESCUE" is the dominant portion of the Applicant's mark.

11. As a result of Applicant's use of the mark "911 RESCUE BAR," the public is likely to be confused and deceived into the mistaken belief that goods offered and advertised by Applicant have their origin with Opposer, and that such goods are approved, endorsed, or sponsored, by, or associated in some way with, Opposer. This confusion is likely since Opposer is already using its mark "RESCUE: 911" on various merchandise items, as noted in Paragraph 7 above. Applicant's use of the

Released June 25, 1992

TRADEMARKS AND UNFAIR TRADE PRACTICES

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Conclusion

The decision of the Board affirming the Examiner's rejection of independent claims 1, 13, 24, and 29 of Fritch's application as unpatentable over the prior art under 35 U.S.C. § 103 is reversed. Since dependent claims are nonobvious if the independent claims from which they depend are nonobvious, the Board's affirmation of the rejection of dependent claims 2-7, 9-12, 14-23, and 30 is also reversed."

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Practice and procedure in Patent and Trademark Office — Interpartes proceedings — Opposition and cancellation — In general (§325.0305.01)

Infringement; conflicts between marks — Likelihood of confusion — In general (§335.0301)

Opposer which uses mark "Rescue: 911" for its television show, which asserts that it has licensed use of mark on various merchandise items, and which seeks to oppose registration of "911 Rescue Bars" for candy bars, must clearly indicate in its pleading whether its claim of likelihood of confusion is based upon its services or its collateral merchandise, or both, and whether it claims priority of use of its mark on its collateral merchandise.

Conclusion

The decision of the Board affirming the Examiner's rejection of independent claims 1, 13, 24, and 29 of Fritch's application as unpatentable over the prior art under 35 U.S.C. § 103 is reversed. Since dependent claims are nonobvious if the independent claims from which they depend are nonobvious, the Board's affirmation of the rejection of dependent claims 2-7, 9-12, 14-23, and 30 is also reversed."

REVERSED

U.S. Patent and Trademark Office Trademark Trial and Appeal Board

CBS Inc. v. Mercandante

Nos. 85,324 and 85,330

Decided June 15, 1992

"In re Gordon, 733 F.2d at 902, 221 USPQ at 1127.

"In re Gorman, 933 F.2d 982, 987, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991). See also Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1138, 227 USPQ 543, 547 (Fed. Cir. 1985).

"In re Fine, 837 F.2d at 1075, 5 USPQ2d at 1600.

"In re Fine, 837 F.2d at 1076, 5 USPQ2d at 1600 (citing *Harness Int'l, Inc. v. Simplimatic Eng'g Co.*, 819 F.2d 1100, 1108, 2 USPQ2d 1826, 1831 (Fed. Cir. 1987)). See also *In re Serraker*, 702 F.2d 989, 991, 217 USPQ 1, 3 (Fed. Cir. 1983) (when argued together, dependent claims with the independent

Released June 25, 1992

TRADEMARKS AND UNFAIR TRADE PRACTICES

1. Acquisition, assignment, and maintenance of marks — Acquisition through use — Priority of use (§305.0503)

Practice and procedure in Patent and Trademark Office — Interpartes proceedings — Opposition and cancellation — In general (§325.0305.01)

Infringement; conflicts between marks — Likelihood of confusion — In general (§335.0301)

Opposer which uses mark "Rescue: 911" for its television show, which asserts that it has licensed use of mark on various merchandise items, and which seeks to oppose registration of "911 Rescue Bars" for candy bars, must clearly indicate in its pleading whether its claim of likelihood of confusion is based upon its services or its collateral merchandise, or both, and whether it claims priority of use of its mark on its collateral merchandise.

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REVERSED

U.S. Patent and Trademark Office Trademark Trial and Appeal Board

CBS Inc. v. Mercandante

Nos. 85,324 and 85,

present. For these reasons, the court adopts the modified jurisdiction test.⁷

[2] The court determines, without hesitation, that Turbo Tek has the continuous and systematic contacts with North Carolina necessary to support general jurisdiction and thus venue. In the last year, Turbo Tek has sold in North Carolina 30,570 of its pressurized washers, 24,720 bottles of soft suds, 7,664 bottles of hard suds, 81,678 bottles of exploding wax, and 864 unspecified products. North Carolina accounts for 3.6% of Turbo Tek's total sales, yielding Turbo Tek over \$300,000.00 in the last year. Turbo Tek transports these goods directly from its facilities in California to its customers in North Carolina. In addition, Turbo Tek has a sales representative who permanently resides in North Carolina and solicits sales throughout the state. Turbo Tek's Vice

President has, on at least one occasion, visited customers within North Carolina. Furthermore, Turbo Tek has run television advertisements on seventeen local television stations in North Carolina. Finally, Turbo Tek operates a mail order business, under the name Distribution Systems International, that has received and honored mail orders from North Carolinians. The court, accordingly, concludes that under the modified jurisdiction test Turbo Tek is "doing business" in North Carolina, thereby establishing venue under §1391(c).

CONCLUSION

The court concludes that plaintiff complied with Fed.R.Civ.P. 4(c)(2)(C)(ii) in personally serving defendant, outside the forum state, with notice of this action. The court further concludes that defendant is "doing business" in North Carolina and thus venue is proper under 28 U.S.C. §1391(c). The court, accordingly, denies defendant's motion to dismiss.

Court of Appeals, Federal Circuit
In re Fine
No. 87-1319
Decided January 26, 1988

PATENTS

1. Patentability/Validity — Obviousness — Evidence of (§115.0903)

Patent and Trademark Office improperly rejected claimed invention for obviousness since nothing in cited references, either alone or in combination, suggests or teaches claimed invention, since there is consequently no support for PTO's conclusion that substitution of one type of detector for another in prior art system, resulting in claimed invention, would have been obvious, and since PTO therefore failed to satisfy its burden of establishing prima facie case of obviousness by showing some objective teaching or gener-

⁷ The Fourth Circuit has not explicitly addressed the proper test for determining "doing business" venue. The two Fourth Circuit cases mentioning "doing business" venue have merely recited the contacts with the forum and then concluded that venue is proper. See *In re Ralston Purina Co.*, 726 F.2d 1007, 1003 (4th Cir. 1984) (*Purina* contacts and then merely states that "Purina is doing business" under 28 U.S.C. §1391(c)); *Du-Al Corp. v. Rudolph Beaver, Inc.*, 540 F.2d 1230, 1233 (4th Cir. 1976) (recites contacts then merely states that "collectively these activities constituted 'doing business'"). Arguably, by explaining that the contacts satisfied personal jurisdiction and then concluding that these same contacts amounted to "doing business," *Du-Al* equates venue and personal jurisdiction. A few cases have interpreted *Du-Al* as equating venue and personal jurisdiction. See e.g., *Precision Rubber Products v. George McCarthy, Inc.*, 605 F.Supp. 473, 477 (M.D.Tenn. 1984), 1985; *Witzel v. Chartered Systems Corp.*, 5 N.Y. 490 F.Supp. 343, 348 (D.Minn. 1980). See also Note, 65 Tex.L.Rev. at n.57 and accompanying text (interprets *Du-Al* as equating venue and personal jurisdiction). Yet, a recent case states that *Du-Al* might be said to have adopted this view [i.e. the jurisdiction test]... although less clearly... and with less discussion [than the other cases adopting the view]. *Maybelline Co.*, 813 F.2d at ¶5 [2 USPQ2d at 1127 n.5] (emphasis added). Moreover, *Du-Al* was decided before the Supreme Court, in *Leroy*, expressed that venue statutes are designed to protect the defendant from an inconvenient forum. In sum, given the inexplicitness of *Du-Al*, the conflicting interpretations of *Du-Al* by other courts, and the fact *Du-Al* was decided before *Leroy*, this court may appropriately attempt to refine the "doing business" standard in the this circuit. As such, the court herein adopts the modified jurisdiction test. The

ally available knowledge that would lead one skilled in art to combine teachings of existing references.

2. Patentability/Validity — Obviousness — In general (§115.0901)

Obviousness is tested by what combined teachings of prior art references would have suggested to those of ordinary skill in art, not by whether particular combination of elements from such references might have been "obvious to try."

3. Patentability/Validity — Obviousness — Evidence of (§115.0903)

Patent and Trademark Office erred, in rejecting as obvious system for detecting and measuring minute quantities of nitrogen compounds, by failing to recognize that appealed claims can be distinguished over combination of prior art references, in view of evidence demonstrating that prior art does not teach claimed temperature range, despite some overlap of preferred temperature ranges for claimed invention and prior art, since purposes of preferred temperature ranges are different and overlap is mere happenstance.

4. Patentability/Validity — Obviousness — In general (§115.0901)

Dependent claims are non-obvious under 35 USC 103 if claims from which they depend are non-obvious.

Appeal from the U.S. Patent and Trademark Office Board of Patent Appeals and Interferences.

Application for patent by David H. Fine, Serial No. 512,374. From decision of Board of Patent Appeals and Interferences affirming rejection of application, applicant appeals. Reversed; Smith, circuit judge, dissenting with opinion.

Morris Relson and Darby & Darby, New York, N.Y., (Beverly B. Goodwin with them on the brief) for appellant.

Lee E. Barrett, associate solicitor, Arlington, Va., (Joseph F. Nakamura, solicitor, and Fred E. McKelvey, deputy solicitor, with him on the brief) for appellee.

Before Friedman, Smith, and Mayer, circuit judges.

Mayer, J.

David H. Fine appeals from a decision of

ences of the United States Patent and Trademark Office (Board) affirming the rejection of certain claims of his application, Serial No. 512,374, and concluding that his invention would have been obvious to one of ordinary skill in the art and was therefore unpatentable under 35 U.S.C. §103. We reverse.

Background

A. The Invention.

The invention claimed is a system for detecting and measuring minute quantities of nitrogen compounds. According to Fine, the system has the ability to detect the presence of nitrogen compounds in quantities as minute as one part in one billion, and is an effective means to detect drugs and explosives, which emanate nitrogen compound vapors even when they are concealed in luggage and closed containers.

The claimed invention has three major components: (1) a gas chromatograph which separates a gaseous sample into its constituent parts; (2) a converter which converts the nitrogen compound effluent output of the chromatograph into nitric oxide in a hot, oxygen-rich environment; and (3) a detector for measuring the level of nitric oxide. The claimed invention's sensitivity is achieved by combining nitric oxide with ozone to produce nitrogen dioxide which concurrently causes a detectable luminescence. The luminescence, which is measured by a visual detector, shows the level of nitric oxide which in turn is a measure of nitrogen compounds found in the sample.

The appealed claims were rejected by the Patent and Trademark Office (PTO) under 35 U.S.C. §103. Claims 60, 63, 77 and 80 were rejected as unpatentable over Eads, Patent No. 3,650,696 (Eads) in view of Warnick, et al., Patent No. 3,746,513 (Warnick). Claims 62, 68, 69, 79, 85 and 86 were rejected as unpatentable over Eads and Warnick in view of Glass, et al., Patent No. 3,207,585 (Glass).

B. The Prior Art.

Eads discloses a method for separating, identifying and quantitatively monitoring sulfur compounds. The Eads system is used primarily in "air pollution control work in the scientific characterization of odors from sulfur compounds."

The problem addressed by Eads is the tendency of sulfur compounds "to adhere to or react with the surface material of the sampling and analytical equipment, and/or react with the liquid or gaseous materials in the environment." Because of this the accuracy

tinuous readouts" of the amount of nitric oxide in the sample. The other words, it contemplates measuring the total amount of nitric oxide in a continuously flowing gaseous mixture of unseparated nitrogen constituents. By contrast, in Fine each nitrogen compound constituent of the gaseous sample is retained in the Chromatograph for an individual time period so that each exits in discrete, time-separated pulses.* By this process, each constituent may be both identified by its position in time sequence, and measured. The claimed system, therefore, diverges from Warnick and teaches advantages not appreciated or contemplated by it. Because neither Warnick nor Eads, alone or in combination, suggests the claimed invention, the Board erred in affirming the Examiner's conclusion that it would have been obvious to substitute the Warnick nitric oxide detector for the Eads sulfur dioxide detector in the Eads system. *ACS Hosp. Sys.*, 732 F.2d at 1575-77, 221 USPQ at 931-33. The Eads and Warnick references disclose, at most, that one skilled in the art might find it obvious to try the claimed invention. But whether a particular combination might be "obvious to try" is not a legitimate test of patentability. *In re Geiger*, 815 F.2d 868, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987); *In re Goodwin*, 576 F.2d 375, 377, 198 USPQ 1, 3 (CCPA 1978).

[2] Obviousness is tested by "what the combined teachings of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). But it "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." *ACS Hosp. Sys.*, 732 F.2d at 1577, 221 USPQ at 933. And "teachings of references can be combined only if there is some suggestion or incentive to do so." *Id.* Here, the prior art contains none.

Instead, the Examiner relies on hindsight in reaching his obviousness determination. * The Solicitor argues that the contents of Attachment C of Fine's brief were not before the Board and may not properly be considered here. However, we need not rely on Attachment C. It is merely illustrative of the qualitative separation of nitrogen compounds which occurs in Fine's system. The fact that the various constituents exit at discrete intervals is shown by the specification which was before the Board and which may appropriately be considered on appeal. See, e.g., *Asstra-Suico, A.B. v. United States Int'l Trade Comm'n*, 629 F.2d 682, 686, 207 USPQ 1, 5 (CCPA 1980) (claims must be construed in light of specification).

The primary basis for the Board's affirmation of the Examiner's rejection was that it would have been obvious to substitute the Warnick nitric oxide detector for the Eads sulfur dioxide detector in the Eads system. The Board reiterated the Examiner's bald assertion that "substitution of one type of detector for another in the system of Eads would have been within the skill of the art," but neither of them offered any support for or explanation of this conclusion.

Eads is limited to the analysis of sulfur compounds. The particular problem addressed there is the difficulty of obtaining precise measurements of sulfur compounds because of the tendency of sulfur dioxide to adhere to or react with the sampling analytic equipment or the liquid or gaseous materials in the equipment. It solves this problem by suggesting that the gaseous sample containing sulfur compounds be absorbed into a sulfur-free methanol and then inserted into a gas chromatograph to separate the sulfur compounds.

There is no suggestion in Eads, which focuses on the unique difficulties inherent in the measurement of sulfur, to use that arrangement to detect nitrogen compounds. In fact, Eads says that the presence of nitrogen is undesirable because the concentration of the titration cell components in the sulfur detector is adversely affected by substantial amounts of nitrogen compounds in the sample. So, instead of suggesting that the system be used to detect nitrogen compounds, Eads deliberately seeks to avoid them; it warns against rather than teaches Fine's invention. See *W. L. Gore & Assoc. v. Garlock, Inc.*, 721 F.2d 1540, 1550, 220 USPQ 303, 311 (Fed. Cir. 1983) (error to find obviousness where references "diverge from and teach away from the invention at hand"). In the face of this, one skilled in the art would not be expected to combine a nitrogen-related detector with the Eads system. Accordingly, there is no suggestion to combine Eads and Warnick.

Likewise, the teachings of Warnick are inconsistent with the claimed invention, to some extent. The Warnick claims are directed to a gas stream from engine exhaust "continuously flowing the gaseous mixtures

Discussion

A. Standard of Review.

Obviousness under 35 U.S.C. §103 is "a legal conclusion based on factual evidence." *Siratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, F.2d 1530, 1535, 218 USPQ 871, 876 (Fed. Cir. 1983) (quoting *Stevens v. Int'l Trade Comm'n*, 612 F.2d 546, 549, 204 USPQ 276, 279 (CCPA 1979)). Therefore, an obviousness determination is not reviewed under the clearly erroneous standard applicable to fact findings. *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 956, 220 USPQ 592, 596 (Fed. Cir. 1983); it is "reviewed for correctness or error as a matter of law." *In re De Blauwe*, 736 F.2d 699, 703, 222 USPQ 191, 195 (Fed. Cir. 1984).

To reach a proper conclusion under §103, the decisionmaker must step backward in time and into the shoes worn by [a person having ordinary skill in the art] when the invention was unknown and just before it was made. In light of all the evidence, the decisionmaker must then determine whether ... the claimed invention as a whole would have been obvious at that time to that person. 35 U.S.C. §103. The answer to that question partakes more of the nature of law than of fact, for it is an ultimate conclusion based on a foundation formed of all the probative facts.

Panduit Corp. v. Dennison Mfg. Co., 810 F.2d 1561, 1566, 1 USPQ2d 1593, 1595-96 (Fed. Cir. 1987).

B. Prima Facie Obviousness.

Fine says the PTO has not established a *prima facie* case of obviousness. He contends the references applied by the Board and Examiner were improperly combined, using hindsight reconstruction, without evidence to support the combination and in the face of contrary teachings in the prior art. He argues that the appealed claims were rejected because the PTO thought it would have been "obvious to try" the claimed invention, an unacceptable basis for rejection.

[1] We agree. The PTO has the burden under section 103 to establish a *prima facie* case of obviousness. See *In re Piasecki*, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-87 (Fed. Cir. 1984). It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. *In re Lulu*, 747 F.2d 703, 705, 223 USPQ 1257, 1260 (Fed. Cir. 1984). See also *Ashland Oil*

cy of measurement is impaired. To solve the problem, the Eads system collects an air sample containing sulfur compounds in a sulfur-free methanol solution. The liquid is inserted into a gas chromatograph which separates the various sulfur compounds. The compounds are next sent through a pyrolysis furnace where they are oxidized to form sulfur dioxide. Finally, the sulfur dioxide passes through a measuring device called a microcoulometer which uses titration cells to calculate the concentration of sulfur compounds in the sample.

2. Warnick Patent.

Warnick is directed to a means for detecting the quantity of pollutants in the atmosphere. By measuring the chemiluminescence of the reaction between nitric oxide and ozone, the Warnick device can detect the concentration of nitric oxide in a sample gaseous mixture.

Warnick calls for "continuously flowing" a sample gaseous mixture and a reactant containing ozone into a reaction chamber. The chemiluminescence from the resulting reaction is transmitted through a light-transmitting element to produce continuous readouts of the total amount of nitric oxide present in the sample.

3. Glass Patent.

The invention disclosed in Glass is a device for "completely burning a measured amount of a substance and analyzing the combustion products." A fixed amount of a liquid petroleum sample and oxygen are supplied to a flame. The flame is then spark-ignited, causing the sample to burn. The resulting combustion products are then collected and measured, and from this measurement the hydrogen concentration in the sample is computed.

C. The Rejection.

The Examiner rejected claims 60, 63, 77 and 80 because "substitution of the [nitric oxide] detector of Warnick for the sulfur detector of Eads would be an obvious consideration if interested in nitrogen compounds, and would yield the claimed invention." He further asserted that "Eads teaches the [claimed] combination of chromatograph, substitution, and detection, in that order.... Substitution of detectors to measure any component of interest is well within the skill of the art." In rejecting claims 62, 68, 69, 79, 85 and 86, the Examiner said, "Glass et al. teach a flame conversion means followed by a detector, and substitution of the flame conversion means of Glass et al. for the furnace of Eads would be an obvious equivalent and would yield the claimed inven-

Particular patents — Electrical — Power supply circuits

3,876,956, Levinson, regulated power supply circuit for a heating magnetron, holding of invalidity vacated, holding of non-infringement affirmed.

Appeal from the U.S. District Court for the Northern District of Illinois, McGarr, J.; 231 USPQ 1.

Action by Advance Transformer Co. against Melvin L. Levinson, seeking declaration of invalidity and non-infringement of patents, and counterclaim by Levinson for patent infringement and declaration of interference under 35 USC 291. From decision holding patents invalid and not infringing, refusing to declare interference, and awarding attorney's fees to plaintiff, defendant Levinson appeals. Holding of invalidity vacated, holding of non-infringement affirmed, and award of attorney's fees reversed.

James T. Williams and Neuman, Williams, Anderson & Olson (Theodore W. Anderson and Todd P. Blakely with them on the brief), Chicago, Ill., for plaintiff-appellee.

Harry B. Keck (Thomas H. Murray with him on the brief), Pittsburgh, Pa., for defendant-appellant.

Before Re. * chief judge, and Newman and Bissell, circuit judges.

Newman, J.

Melvin L. Levinson appeals the judgment of the United States District Court for the Northern District of Illinois, which held invalid and not infringed his United States Patents Nos. 3,876,956 and 3,792,369, refused to declare an interference under 35 U.S.C. §291, and awarded attorney fees to the declaratory plaintiff Advance Transformer Co.

We affirm the judgments of noninfringement of United States Patents No. 3,876,956 and No. 3,792,369, and vacate the judgments of invalidity with respect to both patents. The refusal to declare an interference is affirmed.

* The Honorable Edward D. Re, Chief Judge, United States Court of International Trade, sitting by designation pursuant to 28 U.S.C. §293(a).

Advance Transformer Co. v. Levinson, 231

placed controlling reliance on defendant's representations to Patent and Trademark Office that defendant's claims and prior patent did not describe same or overlapping inventions, and thus court did not err in determining that plaintiff's device, which employs same circuitry as prior patent, does not infringe defendant's patent.

2. Patent construction — Patent Office proceedings — (§125.05)

JUDICIAL PRACTICE AND PROCEDURE

Procedure — Evidence — In general (§410.3701)

Federal district court, in deciding whether to declare interference under 35 USC 291, properly considered evidence demonstrating that defendant made no attempt to provoke interference during pendency that Patent and Trademark Office had not declared interference, and properly considered whether claims of respective patents "cross-read" on each other, and therefore court's conclusions that patents do not claim same subject matter and that interference should not be declared were not erroneous.

3. Procedure — Moot controversies (§410.12)

Appellate court's determination that patent was not infringed renders moot dispute as to patent's validity, and federal district court's holding that patent is invalid is therefore vacated.

REMEDIES

4. Monetary remedies — Attorney's fees; costs — Patents (§510.0905)

Federal district court erred by assessing attorney's fees against defendant in action seeking declaratory judgment of invalidity and non-infringement, since defendant was not shown to have acted in bad faith or fraudulently, since defendant litigated all pertinent issues, since defendant's position on merits was not totally without substance, and since defendant's patents were presumptively valid.

Particular patents — Electrical — Control circuits

3,792,369, Levinson, variable reactance controls for AC powered heating magnetron, holding of invalidity vacated, holding

failed to accord proper weight to the objective evidence of unexpected superior results. *Id.*

E. The "Flame" Claims.
[4] Claims 62, 68, 69, 79, 85 and 86 relate to the oxygen-rich flame conversion means of the claimed invention. These "flame" claims depend from either apparatus claim 60 or method claim 77. Dependent claims are non-obvious under section 103 if the independent claims from which they depend are nonobvious. *Hartness Int'l Inc. v. Simplimatic Eng'g Co.*, 819 F.2d 1100, 1108, 2 USPQ2d 1826, 1831 (Fed. Cir. 1987); *In re Abele*, 684 F.2d 902, 910, 214 USPQ 682, 689 (CCPA 1982); *see also In re Sernaker*, 702 F.2d 989, 991, 217 USPQ 1, 3 (Fed. Cir. 1983). In view of our conclusion that claims 60 and 77 are nonobvious, the dependent "flame" claims are also patentable.

Conclusion

The Board's decision affirming the Examiner's rejection of claims 60, 62, 63, 68, 69, 77, 79, 80, 85 and 86 of Fine's application as unpatentable over the prior art under 35 U.S.C. §103 is *REVERSED*.

Smith, circuit judge, dissenting.

I respectfully dissent. I am of the firm belief that the prior art references, relied upon by the PTO to establish its *prima facie* case of obviousness, in combination teach and suggest Fine's invention to one skilled in the art. Also, I firmly believe that Fine failed to rebut the PTO's *prima facie* case. On this basis, I would affirm the board's determination sustaining the examiner's rejection, pursuant to 35 U.S.C. §103, of Fine's claims on appeal before this court.

Court of Appeals, Federal Circuit

Advance Transformer Co. v. Levinson

No. 87-1011

Decided January 28, 1988

PATENTS

1. Infringement — Construction of claims (§115.03)

Patent construction — Patent Office proceedings (§125.05)

Patent construction — Prosecution history estoppel (§125.09)

Federal district court in action for declaration of invalidity

it this court has said, "To impute one of ordinary skill in the art with knowledge of invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the sinister effect of a hindsight syndrome herein that which only the inventor taught used against its teacher." *W.L. Gore, Jr.*, 721 F.2d at 1553, 220 USPQ at 312-13. It is essential that "the decisionmaker forget that he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made . . . to occupy the mind of one skilled in the art who is normally guided by the then-accepted wisdom in the art." *Id.* One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to preclude the claimed invention.

Advantage Not Appreciated by the Prior Art.

[3] The Board erred not only in improperly combining the Eads and Warnick references but also in failing to appreciate that the appealed claims can be distinguished over that combination. A material limitation of the claimed system is that the conversion of nitric oxide occurs in the range of 600°C to 700°C. The purpose of this limitation is to prevent nitrogen from other sources, such as the air, from being converted to nitric oxide and thereby distorting the measurement of nitric oxide derived from the nitrogen compounds of the sample.

The claimed nitric oxide conversion temperature is not disclosed in Warnick. Although Eads describes a preferred temperature of 675°C to 725°C, the purpose of this range is different from that of Fine. Eads requires the 675°C to 725°C range because it affords a temperature low enough to avoid formation of unwanted sulfur trioxide, yet high enough to avoid formation of unwanted sulfides. Fine's temperature range, in contrast, does not seek to avoid the formation of sulfur compounds or even nitrogen compounds. It enables the system to break down the nitrogen compounds of the sample while avoiding the destruction of background nitrogen gas. There is a partial overlap, of course, but this is mere happenstance. Because the purposes of the two temperature ranges are entirely unrelated, Eads does not teach use of the claimed range. *See In re Geiger*, 815 F.2d at 688, 2 USPQ2d at 1278. The Board erred by concluding otherwise.

D. Unexpected Results.

Because we reverse for failure to establish

Court of Customs and Patent Appeals

In re Ehrreich and Avery

No. 78-561

Decided Jan. 11, 1979

ATTENTS

Claims — Indefinite — In general
(§20.551)

Claims — Specification must support
(§20.85)

Specification — Sufficiency of disclosure (§62.7)

Second paragraph of 35 U.S.C. 112 permits only to claims; agreement, or lack thereof, between claims and specification is properly considered only with respect to paragraph of Section 112, and is irrelevant to compliance with second paragraph that section.

Claims — Specification must support
(§20.85)

35 U.S.C. 112 does not permit examiner study applicants' disclosure, formulate inclusion as to what examiner regards as broadest invention supported by disclosure, and then determine whether claims are broader than examiner's conception of what "invention" is.

Claims — Indefinite — In general
(§20.551)

Claims — Specification must support
(§20.85)

Specification — Sufficiency of disclosure (§62.7)

First sentence of second paragraph of 35 U.S.C. 112 is essentially requirement for precision and definiteness in claim language; if scope of subject matter embraced in claim is clear, and if applicant has otherwise indicated that he intends it to be of different scope, claim does not particularly point out and distinctly claim subject matter that applicant regards as his "invention," that is, if "enabling," disclosure of specification is not commensurate in scope with subject matter encompassed by claim, if it fact does not render claim imprecise or indefinite or otherwise not in compliance with second paragraph of Section 112; claim it is of such breadth that it reads on subject matter as to which specification is not enabling should be rejected under Section 112, first paragraph.

Claims — Broad or narrow — In general (§20.201)

Patentability — Anticipation — In general (§51.201)

Pleading and practice in Patent Office — Rejections (§54.7)

Claim that is of such breadth that it reads on subject matter disclosed in prior art is rejected under 35 U.S.C. 102 rather than under second paragraph of Section 112; Section 112 rejections need not be labeled "first paragraph," or second paragraph," although it should be made clear exactly which Section 112 requirement is thought not to have been met.

5. Pleading and practice in Patent Office — Rejections (§54.7)

Rejection not based on indefiniteness or lack of clarity of claim language, but only on alleged lack of agreement with scope of specification is treated as one made only under first paragraph of 35 U.S.C. 112.

6. Construction of specification and claims — Broad or narrow — In general (§22.101)

Construction of specification and claims — By specification and drawings — In general (§22.251)

Claim language is to be given its broadest reasonable interpretation in light of specification.

7. Patentability — Anticipation — Combining references (§51.205)

Reference must not be considered in vacuum, but against background of other references of record that may disprove theories and speculations in reference, or reveal previously undiscovered or unappreciated problems; question in 35 U.S.C. 103 case is what references would collectively suggest to one of ordinary skill in art, and it is only by proceeding in this manner that scope and content of prior art may be fairly determined according to mandate of Graham v. John Deere Co., 148 USPQ 459.

8. Patentability — Anticipation — Combining references (§51.205)

Patentability — Invention — In general (§51.501)

Patentability issue must be approached in terms of what would have been obvious to one of ordinary skill in art at time invention was made in view of sum of all relevant teachings in art, not in view of first one and then another of isolated teachings in art; entirety of disclosure made by references, must be considered and combining them in-

9. Claims — Introductory phrase
(§20.60)

Preamble elements in Jepson-type claim are implicitly admitted to be old in art.

10. Patentability — Invention — In general (§51.501)

Finding of obviousness should not be based on implied admission erroneously creating imaginary prior art; this is not purpose of 35 U.S.C. 103.

Particular patents — Conductive Plastics

3,583,930, Ehrreich and Avery, Plastics Made Conductive With Coarse Metal Fillers, rejection of claims 1-45 of reissue application reversed.

Appeal from Patent and Trademark Office Board of Appeals.

Application for reissue of patent of John E. Ehrreich and Donald Avery, Serial No. 379,784, filed July 16, 1973, to reissue Patent No. 3,583,930, issued June 8, 1971. From decision rejecting claims 1-45, applicants appeal. Reversed; Baldwin, Judge, concurring, with opinion.

David G. Conlin, Sewall P. Bronstein, Donald Brown, and Dike, Bronstein, Roberts, Cushman & Plund, all of Boston, Mass., for appellants.

Joseph F. Nakamura (William H. Beha, Jr., of counsel) for Commissioner of Patents and Trademarks.

Before Markey, Chief Judge, and Rich, Baldwin, Lane, and Miller, Associate Judges.

Rich, Judge.

This appeal is from the decision of the Patent and Trademark Office (PTO) Board of Appeals (board) affirming the rejection of claims 1-45, all of the claims in application serial No. 379,784, filed July 16, 1973, for reissue of U.S. Patent No. 3,583,930, entitled "Plastics Made Conductive With Coarse Metal Fillers." The board affirmed the examiner's rejection of all claims as obvious under 35 USC 103. In addition, the examiner's rejection of claims 1-8, 12-24, 26-31, 33-36, 38-43, and 45 under 35 USC 112 was sustained by the board. We reverse.

The Invention

Appellants' invention pertains to improved electrically-conductive coatings, gaskets, and caulking compounds useful for

waveguide assemblies, weathertight R.F. (radio frequency) enclosures, and other applications requiring environmental sealing and electromagnetic radiation (EMR) shielding. A compressible or resilient plastic material is loaded with silver-coated metal particles which are held in electrically-conductive, metal-to-metal contact by the plastic binder or matrix. Appellants' improvement resides in their discovery that high-volume loadings of the plastic material, in the order of 35 to 80 volume percent, utilizing large particles (0.5 to 40 mils) having a high surface area per unit volume, i.e., between 450 to 200,000 square feet/cubic foot, results in a product having high conductivity, and, hence, good EMR shielding capability. The invention may be better understood from an examination of claims 1, 9, and 12, the only independent appealed claims. Claim 12 is the broadest claim:

12. In an electromagnetic energy shield having a volume resistivity to be effective as an electromagnetic shield comprising a resin matrix loaded with particles coated with silver in an amount of about 40 to 80 volume percent, the improvement being that the silver coated particles are of a maximum size in the range of from 0.5 to 40 mils and wherein the resin in [sic] compressible.

Claim 1 is the same except for being limited to an EMR shield "in the form of a gasket or caulking compound." Claim 9 is limited to an EMR shield in the form of a gasket wherein the particles are spherical:

9. An electromagnetic energy shield in the form of a gasket having a volume resistivity to be effective as an electromagnetic energy shield comprising a compressible resin matrix loaded with substantially spherical particles coated with a layer of silver and ranging in size from 0.5 to 40 mils.

The Prior Art

The following references were cited by the examiner and relied on in various combinations to support the rejection of the claims under §103:

Wood	2,313,378	March 9, 1943
Wood	2,506,728	May 5, 1950
Colman et al.	2,771,380	Nov. 20, 1956
Price	3,030,337	April 17, 1963
Ueda	3,093,169	March 18, 1963
Hunter	3,093,578	March 18, 1963
Cumling, W. R., et al.	"Materials for R.F. Shielded Chambers and Enclosures," <i>Proceedings, 4th National Symposium on Radio Frequency Interference</i> , June 20-29, 1962.	

Ueda discloses thermally and electrically conductive plastics made by mixing a water-soluble phenolic resin with ultra-fine (approximately 0.1 μ m) powders of carbon in combination with similarly sized powders of various metals. His normally hard product may be made flexible by the addition of polyvinyl alcohol to the phenolic resin mixture. Ueda states that the superior conductivity of his composition is due largely to the presence of the water in the phenolic mixture. In that way, Ueda claims to overcome a prior art dilemma of how to increase conductivity without adverse effect on mechanical properties caused by addition of a large proportion of conductive particles in the compositions. Otherwise, he is content as to the amount of powdered mixture to be added to the resin.

Hunter discloses an electrically conductive, heat-producing coating composition made from finely powdered (particle size less than 4 mils) conductive substances, viz., carbon, silver, iron, in combination with a flexible resin, wherein the concentration of the powdered conductive component is between 22-53% by volume. It is disclosed as having a resistance sufficient to enable its use as a heating element. Hunter teaches that a mixture of finely powdered carbon, angular silver, and granular iron particles must be used, and that the granule form of metal particles is superior to the flake form. Example X, Hunter teaches that when the concentration exceeds 53% the coating becomes deficient in mechanical properties such as adherence and flexibility.

Coleman et al. disclose a method of coating copper particles with silver. The articles to be coated may be as large as 40 mils, and Coleman et al. state that such particles may be used in applications calling for electrically-conductive compositions or coatings. The disclosure is not limited to any particular particle shape.

Wood discloses a thermally and electrically conductive sponge rubber composition, used as a heat dissipator or electrostatic shield, in a mounting for electrical components. Particles, preferably in "fine" form (no size range is specified), are added to the sponge rubber in an amount determined by the degree of conductivity desired. Wood states that there is "no finite upper limit" to the amount of conductive material which may be added to the rubber and suggests he may use "50% or even more" but discloses no more than 20% weight of powdered aluminum in any composition which he has "used

Price discloses the use of substantially spherical particles of gold, silver, copper, or aluminum in combination with flake-type particles of the same materials in conductive resinous coatings. The maximum particle size taught is approximately 44 microns, and Price directs that specified portions of the two different shapes of particles must be used to achieve the desired result.

McGrath discloses a conductive sealing compound for metal joints which sets or vulcanizes when the surfaces to which it has been applied are heated by spot-welding. The compound is made conductive by inclusion of iron or copper filings, carbon black, and the like. The vulcanized composition forms a substantially gas and liquid-imperious seam or joint.

Symposium Digest discloses that silver-coated particles can be added to plastic binders to make gaskets and caulking compounds with good R.F. shielding properties. Only the use of "finely divided" particles (size unspecified) is discussed, and no ingredient portions are given.

The Rejections

35 USC 112

Appellants' problems under §112 stem from the language in claims 1 and 12 which define the particle size as being "of a maximum size in the range of from 0.5 to 40 mils." The board agreed with the examiner that this language defined only the largest particles and did not define the lower limit of particle size. Although the board opinion is not explicit, we read it as affirming the examiner's rejection under both paragraphs 1 and 2 of §112. Since the specification discloses the necessity of using coarse particles, this interpretation of the language of claims 1 and 12 causes the specification to be at variance with the claims, resulting in the rejection under paragraph 2 of §112 as not being what applicants regard as their invention. In addition, this language makes the claims read on the ultra-fine prior art particles and results in a rejection under paragraph 1 of §112 as broader than the specification — i.e., lacking support therein.

The board stated:

The specification clearly sets a lower and upper limit for the suitable particle size. The claims before us read on particles having a size less than 0.5 mils and accordingly, do not claim what applicants regard as their invention and are broader than the specification. [Emphasis ours.]

The emphasized portion of the board's statement effectively sets out rejections under both

35 USC 103

The rejections under 35 USC 103 were made by considering the claims in three groups. The group I claims, drawn to a shield in the form of a gasket or caulking compound, comprising claims 1-3, 7, 12-15, 17, 21-22, 25, 30-31, 33-36, 39, 41, and 45, were rejected as obvious from Ueda or Hunter in view of Coleman et al. and Wood. The examiner reasoned that, in view of the teachings of Ueda and Hunter that electrically-conductive plastic materials could be made from silver particles:

It would be obvious to replace the silver particles of Ueda or Hunter with silver coated copper particles since Coleman et al., teaches [sic] using such particles in conductive compositions and that such compositions will have superior conductivity. Wood teaches [sic] that when metal particles are dispersed in rubber there is no upper limit on the amount of metal that can be added, the amount chosen depending on the conductivity desired. In view of Wood it would be obvious to one skilled in the art to choose a volume percent depending on the conductivity desired.

The group I claims were also found obvious from Symposium Digest in view of Wood. The examiner's rejection was simply stated in these words:

5. Claims 1-3, 7, 12-15, 17, 21-22, 25, 30-31, 33-36, 39, 41 and 45 are rejected as being unpatentable over Symposium Digest in view of Wood under 35 U.S.C. 103. Symposium Digest discloses that silver coated copper particles can be added to plastic to make either a gasket or caulking compound with good R.F. shielding properties. Wood teaches that in adding metal particles to rubber there is no upper limit on the percent added, the amount added depending on the conductivity desired. In view of Wood [it would be] obvious to choose the volume percent as desired.

The group II claims, drawn to compositions utilizing spherical particles, were rejected as obvious from Ueda or Hunter in view of Coleman et al. and Wood for the same reasons given for the group I claims, and further in view of Price, who teaches use of spherical silver particles. According to the examiner:

3. Claims 4-6, 8-11, 16, 18-20, 23-24, 26-29, 32, 37-38, 40, 42-44 are rejected as being unpatentable over either Ueda or Hunter in view of Coleman and Wood for

the same reason as stated * * * [above] and further in view of Price under 35 U.S.C. 103. In a conductive coating Price teaches that silver particles can be used in the form of spheres. See column 1, lines 1-2, 59-61; column 2, line 9. In view of Price it would be obvious to use spheres as Coleman et al.'s particles.

Applicant's [sic] arguments with respect to Price are not at issue since it is solely being used to teach a particular particle shape.

In addition, the group II claims were rejected as obvious from Symposium Digest in view of Wood and further in view of Price for the same reasons as stated above.

The group III claims, drawn to compositions using spherical particles and formed into gaskets, comprising claims 9-11, 25-29, 37, and 43, were rejected as obvious from Ueda or Hunter in view of Coleman et al., Wood, and Price, for the same reasons as stated above, and further in view of McGrath, who teaches that conductive compositions comprising metal particles and resin can be formed into compressible gaskets.

In agreeing with the examiner, the board merely adopted the reasons of the examiner as its own after commenting further on the significance of the primary references. It was noted that while not all of the references discussed the EMR shielding capabilities of the disclosed compositions, those capabilities would be inherently expected of such compositions. Appellants were criticized for arguing the references separately rather than collectively, as used in the rejections, for what they would suggest to those of ordinary skill in the art.

Opinion

The §112 Rejections

Preliminarily, we note that the rejection under the second paragraph of §112 is predicated on a comparison of the claims with the specification. The examiner and the board held that since, in their opinion, the claims did not recite the lower particle size limit which the specification disclosed as critical to the invention, appellants had failed to particularly point out and distinctly claim the subject matter they regarded as their invention.¹ We cannot accept this reasoning.

¹ The examiner stated in his final rejection:

(B) Claims 1-45 are rejected as failing to particularly point out and distinctly claim what

the particle's largest dimension.⁷ In our opinion, one skilled in the art having the specification in mind would read the claim language as defining both an upper and lower limit on particle size. The specification explicitly states that the preferable maximum particle size is 40 mils and that the same values are used in the claims, which recite a size range — a concept which most readily makes sense, especially in light of the specification, if viewed as setting forth both an upper and a lower limit.⁸

In addition, the PTO, with respect to identical language in the original claims for which reissue is sought here, refused a request for a certificate of correction which had been sought to remove the word "maximum" from the claims. The request was denied on the recommendation of the Group Director, who stated:

"The proposed change would materially affect the scope of the claims. The term 'maximum' is used with the term 'size' and refers [sic] to the maximum dimension of an irregularly shaped particle. Applicant points out that maximum was not used in claim 9 but in claim 9 the particle was defined as 'substantially spherical' [sic]. [Emphasis ours.]

Thus the PTO has led appellants to believe that their claim language would be given a particular construction by refusing to allow them to remove the very word which it now asserts renders the claims fatally deficient under § 112. The solicitor argues that appellants' construction of the claims at

⁷ Price states:

First, I find that the size or maximum dimension of all pigment particles should be approximately 44 microns (0.0017"). * * * [Emphasis ours.]

Hunter states:

* * * the granules should be less than about 100 microns in maximum dimension and preferably smaller. [Emphasis ours.]

Coleman states:

The method has been used with success with particles which range in size from about one millimeter to a few microns in their maximum dimension. [Emphasis ours.]

* One skilled in the art, with knowledge of the technique for measuring irregularly-shaped particles, would interpret the term "maximum size" as recited in the claims to relate to the measurement technique, and would apply it to define an upper and lower limit for particle size. Viewed in this light, the claims call for the particles to have a maximum "maximum dimension" of 40 mils and a minimum "maximum dimension" of 0.5 mil.

which is of such breadth that it reads on subject matter disclosed in the prior art is rejected under § 102 rather than under the second paragraph of § 112, a claim which is of such breadth that it reads on subject matter as to which the specification is not "enabling" should be rejected under the first paragraph of § 112 rather than the second. We do not intend hereby to suggest that rejections under § 112 must be labeled "first paragraph" or "second paragraph." What we do suggest is that it should be made clear exactly which of the several requirements of § 112 are thought not to have been met. Is the claim unclear or is the specification's disclosure inadequate to support it? [Emphasis in original; footnotes omitted.]

[5] Since this rejection is not based on indefiniteness or lack of clarity of claim language, but only on the alleged lack of agreement with the scope of the specification, we reverse it as having been improperly made. We therefore treat the rejection under § 112 as one made only under the first paragraph thereof. We will not sustain it.

Because we read the claims as setting forth a minimum particle size limitation, we hold that the examiner and the board erred in finding no such limitation recited. There are several reasons for our conclusion.

[6] Claim language is to be given its broadest reasonable interpretation in light of the specification. In re Okuzawa, 537 F.2d 545, 548, 190 USPQ 464, 466 (CCPA 1976); In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). The limitation at issue requires that "the silver coated particles are of a maximum size in the range of from 0.5 to 40 mils." The examiner and the board noted that the specification explicitly teaches the necessity of using coarse particles to make the compositions, and clearly states that the minimum particle size used is 0.5 mil. Both, however, interpreted the words "maximum size in the range of 0.5 to 40 mils" to mean that the largest of the particles should be in the range recited and concluded that no lower limit for particle size was recited.

We think it highly unlikely that one skilled in the art would construe the term "maximum size" as used in this context in the manner suggested by the PTO. Appellants have brought to our attention that the very art cited by the PTO in making the § 103 rejections makes clear that those skilled in the art routinely measure the sizes of irregularly-shaped particles, to which the

2, 3, 4] The second paragraph of § 112 aims only to claims. In re Borkowski, 57 PA 946, 951, 422 F.2d 904, 909, 164 USPQ 642, 645 (1970). Agreement, or lack of, between the claims and the specification is properly considered only in respect to the first paragraph of § 112; irrelevant to compliance with the second paragraph of that section. The PTO approach to the § 112 rejection in this case is strikingly similar to the approach taken by examiner in Borkowski, supra, which we approved. As we said in Borkowski (57 PA at 952, 422 F.2d at 909, 164 USPQ at 646):

The examiner's approach to determining whether appellants' claims satisfy the requirements of § 112 appears to have been to study appellants' disclosure, to formulate a conclusion as to what he (the examiner) regards as the broadest invention supported by the disclosure, and then to determine whether appellants' claims are broader than the examiner's conception of what "the invention" is. We cannot agree that § 112 permits of such an approach to claims. The first sentence of the second paragraph of § 112 is essentially a requirement for precision and definiteness of claim language. If the scope of subject matter embraced by a claim is clear, and the applicant has not otherwise indicated that he intends the claim to be of different scope, then the claim does particularly point out and distinctly claim the subject matter which the applicant regards as his invention. That is to say, if the "enabling" disclosure of a specification is not commensurate in scope with the subject matter encompassed by a claim, that fact does not render the claim imprecise or indefinite or otherwise not in compliance with the second paragraph of § 112; rather, the claim is based on an insufficient disclosure (§ 112, first paragraph) and should be rejected on that ground.

* * * [citations] Thus, just as a claim

applicants regard as their invention under 35 U.S.C. 112 (paragraph 2). At pages 3 and 4 of the specification, applicants cite prior art use of finely divided particles and state that the instant invention lies in the use of coarse particles which by definition are large particles). See also page 13, example 3. As such, since claim 1 is readable on very fine particles (i.e. no minimum size), it does not define what applicants regard as their invention. The claim merely states a maximum size range from 0.5 to 0 mils but there is no inclusion of a minimum size range.

issue under § 112 would literally read out the word "maximum." He contends that appellants had ample time during prosecution to amend their claims to remove the word but chose not to do so, and now must take the claims as they now read. We agree that appellants must take their claims as they now read, but we are of the opinion that appellants' interpretation of the claims is the more reasonable. Appellants had no reason to wish to amend their claims until the PTO changed its mind regarding interpretation of appellants' claim language. Therefore, the decision of the board affirming the rejection under 35 USC 112 of claims 1-8, 12-24, 26-31, 33-36, 38-43, and 45 is reversed.

The § 103 Rejections

[7] We will reverse all of the rejections under § 103 based upon Symposium Digest combined with Wood. As noted by the board, Symposium Digest "describes silver coated copper particles which may be used to form coatings, gaskets or caulking compositions. Symposium does not define the size of the particles and does not describe the ratio of particles compared to binder." (Emphasis ours.) By disclosing that the metal is preferably in the form of a "fine dust," Wood teaches away from the claimed particle size. What Wood does disclose is that he had successfully used compositions including 20% aluminum by weight. When it is considered that the claimed silver-coated particles are heavier than aluminum particles,⁹ and that the weight percent disclosed by Wood becomes a smaller volume percent than that recited in the claims, we agree with appellants that Wood does not teach appellants' volume loadings. Furthermore, we regard Wood's statements that proportions by weight-percent of "50% or even more may be used," and that "there is no definite upper limit for the powdered metal filler," as pure speculation which would be ignored by those skilled in the art in view of the later teachings of Ueda and Hunter that high particle loadings have a deleterious effect on the mechanical properties of the compositions and are to be avoided. Cf. In re Oelrich, 579 F.2d 86, 91, 198 USPQ 210, 214 (CCPA 1978). We must not here consider a reference in a vacuum, but against the background of the other references of

⁹ Appellants disclose the use of nickel, lead, zinc, cadmium, and copper particles. Volume for volume, all of these particles are heavier than aluminum particles by virtue of their greater atomic weight.

plastic matrix, does not operate as "electromagnetic energy shield." The specification further states that the finely-divided pigment particles in the prior art composition will have "insulating layers of resin * * * between the contiguous particles." Accordingly, the claims do not include subject matter outside the scope of appellants' view of their own invention in spite of absence of the lower limit. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976) (concurring opinion).

Thus, we are directed to no combination of prior art references which would have rendered the claimed subject matter at a whole obvious to one of ordinary skill in the art at the time the invention was made. The PTO has not shown the existence of all of the claimed limitations in the prior art or any suggestion leading to their combination in the manner claimed by appellants.

The remainder of the rejections concerning claim groups II and III, relying as they do on the erroneous combination set forth above, are likewise in error. In view of the foregoing, the rejections of claims 1-45 as obvious under 35 USC 103 are reversed.

Reversed.

Baldwin, Judge, concurring.

I am in full agreement with the result reached in the majority opinion.

I must strongly disagree with the suggestion that rejections under the second paragraph of §112 are somehow limited only to a consideration of whether or not the claims are vague. Extrinsic evidence will sometimes prove that an applicant is not "claiming the subject matter which [he] * * * regards as his invention." In *re Prater*, 56 CCPA 1381, 415 F.2d 1393, 162 USPQ 541 (1969).

This court has specifically countenanced such rejections:

If the scope of subject matter embraced by a claim is clear, and if the applicant has not otherwise indicated that he intends the claim to be of a different scope, then the claim does particularly point out and distinctly claim the subject matter which the applicant regards as his invention. [Emphasis ours.]

In re Borkowski, 57 CCPA 946, 952, 422 F.2d 904, 909, 164 USPQ 642, 645-646 (1970).

An assessment of all of the evidence in this case leads me to the conclusion that appellants are claiming their invention. The examiner argued that the lack of a lower limit to the pigment size in the claims "made the claims readable on fine particles" and since the specification states "that the instant invention lies in the use of coarse particles," appellants do not claim the subject matter they regard as their invention. I disagree.

Each of the independent claims requires that the composition be an "electromagnetic energy shield." The specification reveals that a composition in which the metal particles have insulating films of, e.g., the

order which may disprove theories and calculations in the reference, or reveal previously undiscovered or unappreciated problems. The question in a §103 case is that the references would collectively suggest one of ordinary skill in the art. In *re Non*, 461 F.2d 1387, 174 USPQ 114 (CCPA 1972). It is only by proceeding in this manner that we may fairly determine the type and content of the prior art according to the mandate of *Graham v. John Deere*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966). Therefore, combination of *Symposium Digest* with Wood would not have rendered obvious the particle size limitation the particle volume-percent limitation, and certainly not the subject matter as a whole which encompasses these limitations. In *re Hirao*, 535 F.2d 67, 69, 190 USPQ 17 (CCPA 1976); In *re Prater*, 56 CCPA 81, 415 F.2d 1393, 162 USPQ 541 (1969).

[8] Our review of the record also confirms us that the prior art relied upon by the examiner and the board does not support a holding of obviousness under §103 using the proposed art combinations to reject the group I claims. As we stated in *In re Aderna*, 57 CCPA 1078, 426 F.2d 385, 165 USPQ 575, 578-579 (1970):

We must approach the issue of patentability in terms of what would have been obvious to one of ordinary skill in the art at the time the invention was made in view of the sum of all the relevant teachings in the art, not in view of first one and then another of the isolated teachings in the art.

We must consider the entirety of the disclosure made by the references, and avoid combining them indiscriminately. In *re Nehart*, 531 F.2d 1048, 189 USPQ 143 (CPA 1976).

The rejections all rely on the crucial combination of Ueda or Hunter with Wood. As have explained, we do not accept the speculations of Wood regarding the unlimited volume loadings. We are of the opinion that, when taken in their entirety, Ueda or Hunter, in combination with Wood, do not suggest the claimed combinations.

The board has noted that Ueda fails to teach the claimed particle size, volume loadings, or use of silver-coated particles. Though it may be argued that Hunter may be used to teach appellants' claimed volume loadings,* we decline to apply it in this

manner. Neither the examiner nor the board, having Hunter before them, suggested that the reference teaches this limitation, relying instead solely on Wood. Hunter's concern with providing a fixed resistance property in his compositions, and his warning that the "definite relationship between the proportions of binder and each of the three particulate materials * * * must be observed" (emphasis added) in order to provide mechanically-stable coating compositions possessing, inter alia, the property of flexibility, would, we think, have prevented one of ordinary skill in the art from finding any suggestion in Hunter that a single type of conductive particle could be included in the claimed volume concentrations to form a composition having a high enough conductivity (low enough volume resistivity) "to be effective as an electromagnetic shield." In this respect, appellants are addressing a different problem than did Hunter, a factor which must be considered in evaluation of Hunter as a reference. Thus, the subject matter as a whole would not have been obvious from the references. In *re Hirao* and *In re Prater*, supra.

[9, 10] The solicitor has noted that claims 1 and 12 are in Jepson format (Ex parte Jepson, 1917 C.D. 62, 243 O.G. 526) and asserts that appellants impliedly admit, and that the subject matter recited in combination in the preamble (i.e., up to "the improvement being") is old in the art. We agree that the preamble elements in a Jepson-type claim are impliedly admitted to be old in the art, 37 CFR 1.75(e) (1978); see also *In re Aldrich*, 55 CCPA 1431, 1434, 398 F.2d 855, 857, 158 USPQ 311, 312 (1968), but it is only an implied admission. The fact that none of the art cited by the examiner shows the combination recited in the claim preambles gives credence to appellants' explanation for drafting the claims in Jepson format, which was not intended as an admission, but was to avoid a double patenting rejection in a co-pending case unavailable to the public. We think that a finding of obviousness should not be based on an implied admission erroneously creating imaginary prior art. That is not the intent of §103. We will not use appellants' claim preamble as prior art against them in this situation.

concentrations of between 22 to 53%, "but nowhere argues that this suggests appellants' claimed volume loadings. Like the board and the examiner, we find this fact to be of little significance in light of the references considered in their entirety.

Court of Customs and Patent Appeals

Almasi, et al.
v. Strauss

No. 78-566

Decided Jan. 11, 1979

PATENTS

1. Construction of specification and claims — Interference counts — In general (§22.501)

Materiality in proposed counts of portions omitted from claims must be determined solely by analysis of whether such portions defined material aspects of patentee's invention, in determining propriety of claims copied from patent.

Particular patents — Domain Detector
3,691,540, Almasi, Chang, Keefe, and Thompson, Integrated Magneto-Resistive Sensing of Bubble Domains, denial of priority against Strauss, reissue application, reversed.

Appeal from Patent and Trademark Office Board of Patent Interferences.

Patent interference No. 98,920 between George S. Almasi, Hsin Chang, George E. Keefe, and David A. Thompson, Patent No. 3,691,540, issued Sept. 12, 1972, and Walter Strauss, reissue application, Serial No. 341,490, filed Mar. 15, 1973, to reissue Patent No. 3,609,720 issued Sept. 28, 1971. From decision awarding priority to party Strauss, party Almasi appeals. — Reversed.

Clyde C. Metzger, and Pennie G. Edmonds, both of New York, N.Y., for appellants.

Peter V. D. Wilde, Murray Hill, N.J., for appellee.

that super-critical operation exceeded the practical capabilities of available solenoids, which are stated to have an upper frequency limit of about 175 Hz. Applicants discovered that the Oelrich control, coupled to a low inertia load, can be operated with a sub-critical carrier frequency without incurring unacceptably large dither which, they allege, would have been expected by those of ordinary skill in the art based on the known frequency-response characteristics of high inertia systems. Claims 1 and 2 are illustrative and read (emphasis ours):

1. A time modulated fluid actuated control apparatus comprising:

housing means, said housing means defining a cylinder; actuator piston means disposed in said housing means; cylinder; said piston means including an output member adapted to be connected to a movable load, said load and control apparatus defining a system having a range of resonant frequencies; solenoid operated valve means mounted on said housing means, said valve means being selectively operable to deliver pressurized fluid to and to vent fluid from said housing means; inductor at one side of said piston means; means for generating variable input command signals commensurate with the desired position of the load, said command signals being characterized by a dynamic frequency range below said range of said resonant frequencies; means for generating a signal at a carrier frequency, said carrier frequency being greater than the maximum dynamic command signal frequency and less than the minimum system resonant frequency;

means for modulating said carrier frequency signal by said command signals; and means responsive to said modulated carrier frequency signal for controlling energization of said solenoid operated valve means.

2. The method for the control of a pneumatic position control mechanism employing an expandable chamber motor having an output shaft couple [sic] to a movable load, said method comprising the steps of generating a command signal commensurate with the desired position of the movable load coupled to the control mechanism motor output shaft, the frequency of the command signals being

including the control mechanism and the load; generating a carrier signal at a frequency less than the minimum resonant frequency of the actuator system and greater than the maximum command signal frequency; modulating the carrier frequency signal with a command signal; and controlling the delivery of pressurized gas to the position control mechanism expandable chamber motor in accordance with the magnitude of the modulated carrier frequency signal.

The Rejection

[1] The examiner rejected claims 1-5 under 35 USC 103 as obvious from the Oelrich patent, noting the reference's specific teachings that carrier frequencies yielding "a degree of dither" were desirable and that super-critical operation was merely preferred.² The general teachings of Oelrich that carrier frequency should be selected to optimize system performance indicated to the examiner that selection of a particular carrier frequency was "a mere choice in design" and that optimization of a low-inertia system would have led to the claimed modification.

The Affidavits

In response to the examiner's rejection, four affidavits were submitted in an attempt to show that those of ordinary skill in the art would not have known from the Oelrich patent that the control system there described could be operated satisfactorily with a sub-critical carrier frequency, wherefore operation at such frequency would not have been obvious.

Co-inventors Oelrich and Divigard, conceded by the PTO to be men of ordinary skill in the art, separately aver that the claimed modification was not obvious to them. As objective evidence of his assertion that those skilled in the art, such as himself, did not believe that the Oelrich control was suitable for use with sub-critical carrier frequencies, Divigard appended to his affidavit his own published report on

² Nobody has at any time asserted that apparatus claim 1 is anticipated by Oelrich, and we choose not to consider the question de novo here on appeal. If the question did not turn on facts not of record, e.g., the nature of the Oelrich signal generator, we would be more inclined to reach the issue under the rationale of

the performance of the Oelrich control which specified the use of super-critical carrier frequencies. In the same vein, an attachment to Oelrich's affidavit indicates that Oelrich and Divigard, when actually confronted with customer requests for adaptations of the Oelrich control to low-inertia systems having very high critical frequencies, did not suggest use of sub-critical carrier frequencies, suggesting, instead, that the whole system be modified to reduce the critical frequency and allow the use of a super-critical carrier frequency.

Friedman, an electrical engineering professor whose credentials as one skilled in the art are unquestioned by the PTO, avers that the use of a sub-critical carrier frequency in an Oelrich-type device would not have been obvious to him. Kolk, also a professor of electrical engineering of unimpeached qualification as one skilled in the art, analyzes the teachings of Oelrich in detail. The above-noted distinction between desirable and undesirable degrees of dither in systems such as these is pointed out, the perceptible actuator movement associated with the latter being said to cause mechanical wear. Kolk states that one might be tempted to operate in the sub-critical "valley" in the Fig. 7 frequency-response curve except that the "valley" is too shallow to give acceptable degrees of dither, such being encountered in Fig. 7 only above the critical frequency. Even if the "valley" were deeper, super-critical-frequency operation would still have been called for, in Kolk's opinion, because of the danger of harmonics of the carrier signal (weaker signals at integral multiples of the carrier frequency) exciting the mechanical resonance or interfering with the command signal. Kolk states that the excessive power required to drive a solenoid at a super-critical frequency in a system with a high resonant frequency and the unreliability introduced by mechanical wear caused by such operation would have led him to reject the Oelrich control for use in low-inertia systems.

Kolk avers that the instantly claimed invention lies in the recognition and utilization of a deep, sub-critical "valley" in the frequency-response curve of low-inertia systems employing the Oelrich control.

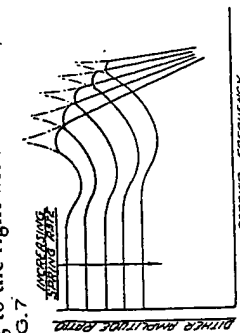
The Board

The board, with one member specially concurring, affirmed the examiner's rejection noting that all of the affidavits stated

able degree of dither is manifested vibration of the device. Excessive (fin) movement, is obviously unstable. The pressure fluctuations that dither are known to depend, inter alia, on the impedance or responsiveness in the load and the carrier signal frequency.

Second factor governing operation of Oelrich control systems is that each system has a natural resonant frequency, sometimes termed "critical frequency." When excited by a carrier signal of critical frequency, system response of proportion to input; that is to say, uncontrolled oscillation of the steering fin.

parties seem to agree that the disclosed in the Oelrich patent was only with the then available fins which they characterize as "inertia" loads. According to Fig. 7 of Oelrich patent, dither amplitude, expressed in terms of "dither amplitude" and carrier frequency in systems operating such loads were known to be related generally as follows (increasing rate connotes increasing load, and inant peaks (broken lines) are shown as ing to the right with increases):



Oelrich patent states that it is preferable to operate the control using carrier frequencies above the critical frequency in order to obtain the desired low dither amplitude. The control there described, however, is subsequently characterized as being adapted to receive a carrier frequency substantially in excess of the particular system's critical or resonant frequency * * *

Invention

With the advent of light-weight missile steering fins, it became desirable to employ the Oelrich control with low inertia loads. It was found, however, that the critical frequency of such a system was so high

a super-critical carrier frequency to a practical system having a certain life span. Since the board felt Oelrich teaches the use of super-critical frequencies merely as "preliminary," it was of the opinion that the use of sub-critical frequency in a system as large dither could be tolerated as failing to state factual basis for the conclusion that the reference whole does not teach the use of sub-critical frequencies. In essence, the board's position was that sub-critical-frequency operation is broadly contemplated by Oelrich, and that the affidavits fail to establish that such operation was thought to be possible.

Arguments

Appellants contend here, as they did before the board, that one of ordinary skill in the art would not have read the Oelrich patent, as a whole, as teaching the use of super-critical carrier frequencies. The affidavits are alleged to establish that the prevailing among those working in the art at the time the invention was made was that Oelrich-type control mechanisms were not suitable for use with sub-critical carrier frequencies, e.g., in systems with very high critical frequencies.

The solicitor, in defending the board's action, has interjected yet another theory on which he urges the rejection might be sustained. It is alleged that Oelrich, at very least, suggests running a frequency response analysis of any system in the use of the Oelrich control was contemplated, and, once a low-inertia system so analyzed, conventional design criteria outlined by Kolk would have dictated operation in the deep sub-critical "valley" would have been discovered. To this argument, appellants predictably respond by arguing that those of ordinary skill in the art would not have been motivated to do such an analysis, thinking no useful purpose would be served thereby based on the expectation that the Oelrich control was unsuitable for use with sub-critical carrier frequencies.

Opinion

For patentability to be negated under §103, the PTO must show that the claimed subject matter would have been obvious to one of ordinary skill in the art at

the time of the prior art, the differences between the claimed invention and the prior art, and the level of ordinary skill in the art. *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). In so doing, the PTO usually must evaluate both the scope and content of the prior art and the level of ordinary skill solely on the cold words of the literature. When only the literature is relied upon, occasionally one or both of these factual inquiries becomes distorted. In *re Palmer*, 59 CCPA 733, 451 F.2d 1100, 172 USPQ 126 (1971). In our opinion, this is such a case.

The evidence of record bearing on the content of the prior art and the level of ordinary skill consists of the words of the Oelrich patent and the affidavits of four persons conceded to have been of ordinary skill in the art. If the affidavits are to be believed, then statements in the Oelrich patent implying that a sub-critical carrier frequency is feasible, albeit not "preferred," must be dismissed as speculation.

[3] Even if speculative, statements appearing in the prior-art literature are good, for purposes of rejection under §103, for all that they would fairly suggest to one of ordinary skill in the art. See *In re Wiggins*, 488 F.2d 538, 179 USPQ 421 (CCPA 1973); *In re Trbojevič*, 53 CCPA 1241, 361 F.2d 1013, 150 USPQ 50 (1966). In determining how the Oelrich disclosure was interpreted by those skilled in the art, we are more impressed by what those so skilled did than by what they said. Even though the words of the Oelrich patent implied that sub-critical operation was feasible, it was never, in fact, considered when a concrete problem requiring such operation was actually presented to two persons of ordinary skill in the art, both intimately familiar with the Oelrich patent. The actions of those skilled in the art reflected by this record indicate that the speculative statements in the Oelrich patent were recognized as such and ignored by those working in the art. The opinions of two other experts are in accord.

We believe the board's criticism of the affidavits for failing to recite factual bases for the conclusions reached is unwarranted in this case. To the extent above noted, the affidavits of Oelrich and Divigard are based on facts. The Kolk affidavit is grounded, in large part, on technically sound applications of unquestioned physical principles. To the extent that all of the affidavits express opinions, they are

uniquely within their competence bearing on the level of ordinary skill in the art at the time the invention was made. Their conclusions are reasonable, and thus more credible, in view of the fact that only a single word ("preferred") in the entire eighteen columns of disclosure in the Oelrich patent is in any way contrary thereto.

[4] While we concur in the sentiment expressed by the board that showings of fact are much preferred to statements of opinion, we are of the view that the nature of the matter sought to be established, as well as the strength of the opposing evidence, must be taken into consideration in assessing the probative value of expert opinion. In this case, the expert opinions were introduced on the issue of the level of ordinary skill, which is usually determined by reference to the subjective reaction of persons so skilled. In *re Meng*, 492 F.2d 843, 181 USPQ 94 (CCPA 1974), and are opposed by a fragile prima facie case of obviousness. In our opinion, the affidavits were sufficient to shift the burden of going forward with the evidence back to the PTO, and that burden has not been sustained. In other words, the prima facie case of obviousness has been overcome.

[5] The solicitor correctly contends that had one conducted a frequency-response analysis on a low-inertia-load system, he would have discovered, as did appellants, that sub-critical control was feasible. The question under §103, however, is not whether one skilled in the art doing what appellants did would have discovered what appellants discovered, but whether it would have been obvious to one of ordinary skill in the art to do what appellants did. In *re Lemin*, 53 CCPA 1382, 364 F.2d 864, 150 USPQ 546 (1966). In view of the affidavits submitted, we think not.

The decision of the board is reversed.

Reversed

U.S. Court of Claims

General Dynamics Corporation
v. The United States

No. 21-76 Decided July 8, 1977

PATENTS

1. Court of Claims — Jurisdiction (§27.5)

Court of Claims — Pleading and practice (§27.7)

Title — Contracts — In general (§66.201)

Government attorney who litigated before Armed Services Board of Contract Appeals without objecting to forum, implicitly agreed to modification that cured defect in parties' contract, whose Patent Rights clause did not specify availability of such specific administrative relief as to bringing licensing controversy developing out of that clause within board's mandatory jurisdiction, vesting board with necessary authority to hear and decide licensing dispute with all finality of Wunderlich Act as interpreted in *S & E Contractors, Inc. v. U.S.*, 406 U.S. 1; contract modification affirming board's authority to pass on parties' licensing dispute is to be enforced in Court of Claims action against U.S. for patent infringement in that facts found by board are binding on Government within Supreme Court's rulings in *U.S. v. Utah Construction & Mining Co.*, 384 U.S. 394, and *S & E Contractors, Inc. v. U.S.*, 406 U.S. 1.

2. Court of Claims — Pleading and practice (§27.7)

Party alleging infringement can properly accept Armed Services Board of Contract Appeals' fact-finding on license issue and still ask for trial to take additional evidence on validity dispute.

3. Court of Claims — Jurisdiction (§27.5)

Court of Claims has exclusive jurisdiction over patent infringement claims brought against Government, but that vesting of jurisdiction is no more exclusive than that granted court over contract

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